DIESEL PROGRESS

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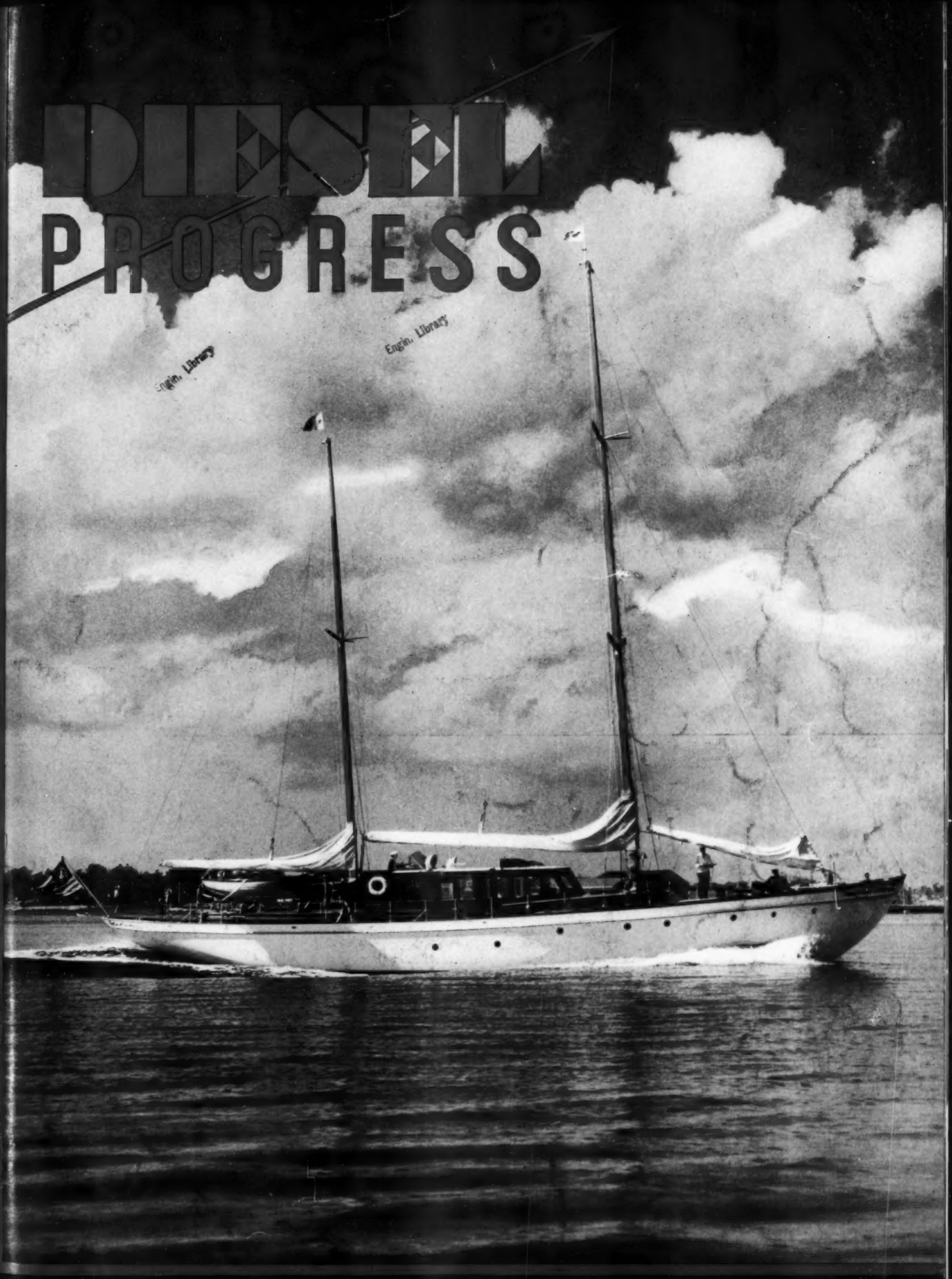

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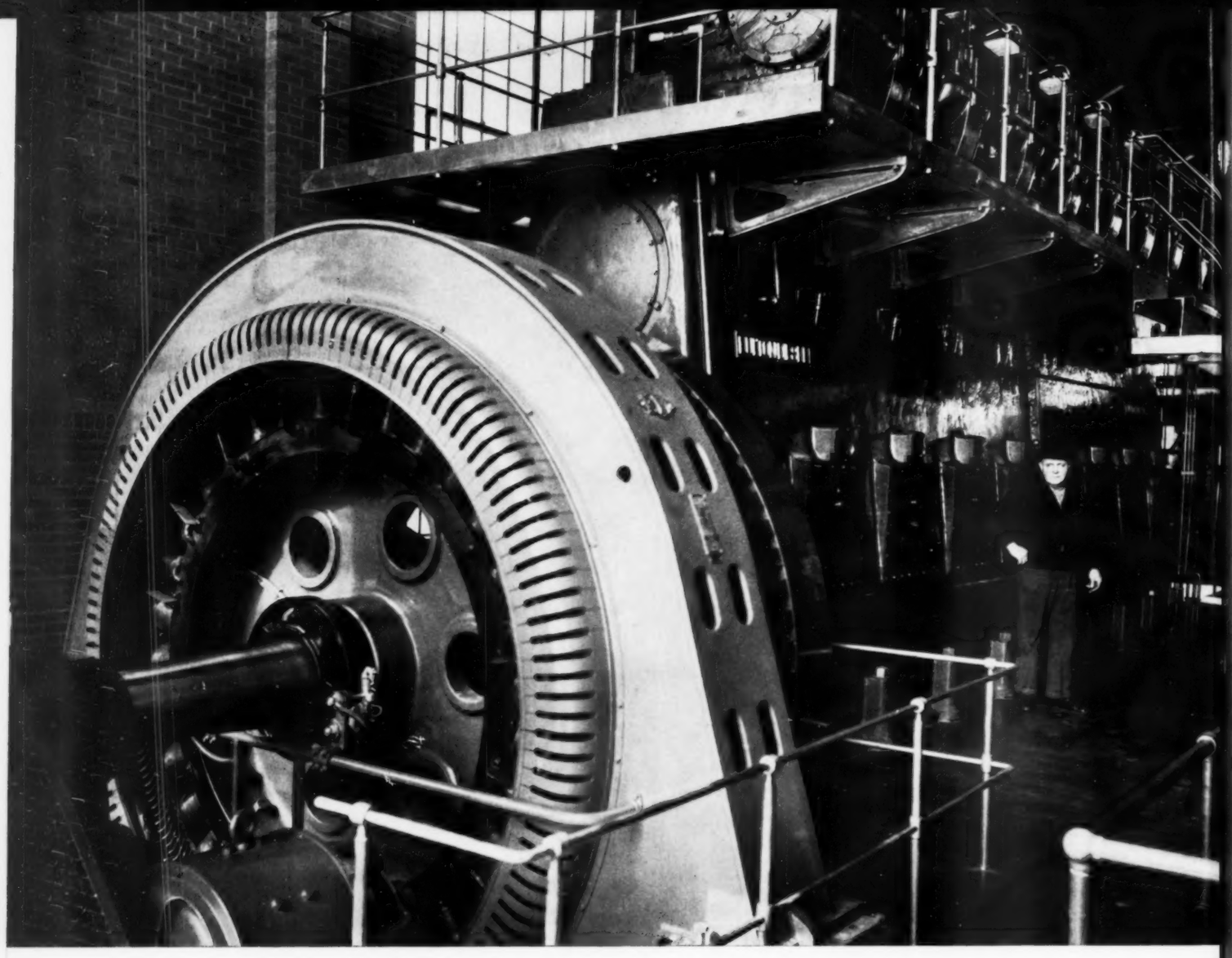

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REX W. WADMAN
Editor and Publisher

FRONT COVER ILLUSTRATION: Commodore C. D. Mallory's new Diesel Yacht *Bonnie Dundee* powered with a pair of six cylinder, 165 hp. Gray Diesels. See detailed description on pages 35, 36, and 37.

TABLE OF CONTENTS ILLUSTRATION: Trinidad, Colorado, finds a thousand and one uses for its Caterpillar Diesel tractor. In this particular instance, the unit is grading for an ice rink, working sixteen hours a day on 2½ gals. of fuel per hour.

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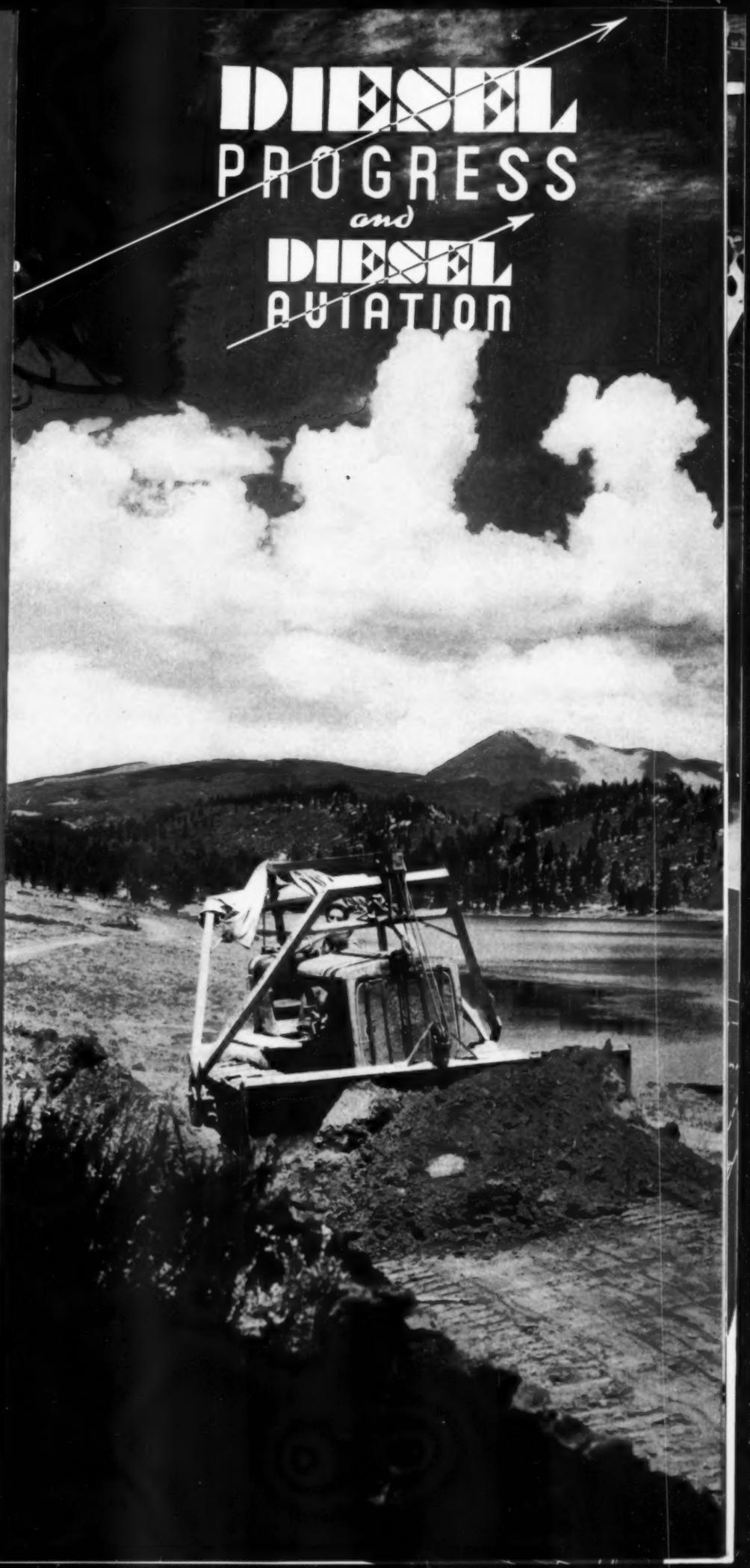


EDMOND J. MORAN

New Sea-Going, Diesel-Electric Tug With A Cruising Radius of 10,000 Miles For Moran Towing & Transportation Company

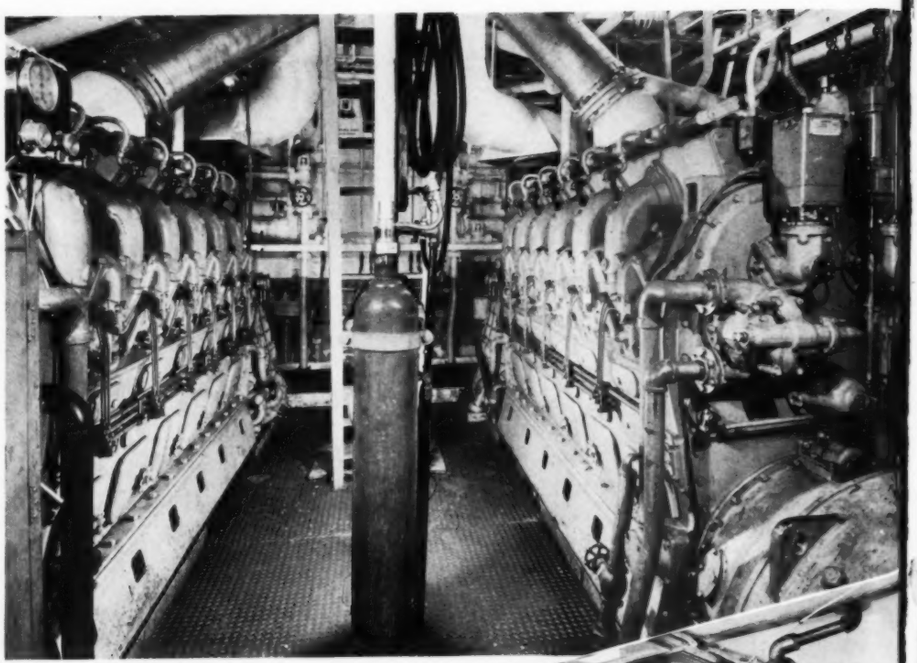
LATE last month, the Moran Towing & Transportation Company took delivery of its eighth Diesel towboat. This ocean-going tug, *Edmond J. Moran,* the largest and most powerful addition to their Diesel-electric fleet, was turned over to its owners at Baltimore on Saturday, September 21, following a record run from the Pennsylvania Shipyards, Inc., at Beaumont, Texas, where she was built and given her trials on September 10. The approximate dimensions of the new towboat follow: length over all, 121′ 10″; beam, 29′ 6″; depth at side amidships, 16′. Fuel bunkers of the new Moran tug have a capacity of 52,000 gallons, which will provide a cruising radius of 10,000 miles. The fresh culinary water tanks have a capacity of 6,460 gallons, and ample dry stores and refrigerated space to make it possible for the new towboat to remain at sea with a full crew for about thirty days.

This new Moran tug is credited with being one of the most efficient of modern tugboats in use in the Western Hemisphere and the owners of the vessel plan to use it primarily for deep sea towing and wrecking service.

The *Edmond J. Moran* was designed by Tams, Inc., marine architects and engineers. The main propulsion machinery was designed and built by the Cleveland Diesel Engine Division of General Motors Sales Corporation, whose engineers worked out the electrical features, including the unique system of propulsion control. Two General Motors two cycle Diesel engines furnish power for two main generating units and two driving motors which work through a reduction gear to a single shaft and propeller.

With the addition of the *Edmond J. Moran,* the Moran Towing & Transportation Company now has a Diesel fleet of eight towboats. Six of these boats are powered with General Motors two cycle Diesel engines and two of them with Alco-Sulzer two cycle Diesel engines. Of the total fleet, five have Diesel-electric drive and three of the earlier ones have direct Diesel drive. These are now in Navy use.

The hull of the new ocean-going Moran tug is



Close up of the pair of General Motors two cycle Diesel engines installed in the "Edmond J. Moran."

Pilot house of the "Edmond J. Moran" showing direction finder and radio direction finder. →

Panel board on which the controls for this new Diesel-electric, ocean-going tug are centered.

of welded construction throughout, proportioned to meet the needs of severe service, and was built to the American Board of Shipping classification of A-1 for ocean towing service. A double bottom extends for the greater part of the machinery space and is divided into four separate tanks for fresh water. There are six fuel tanks, as well as large ballast tanks.

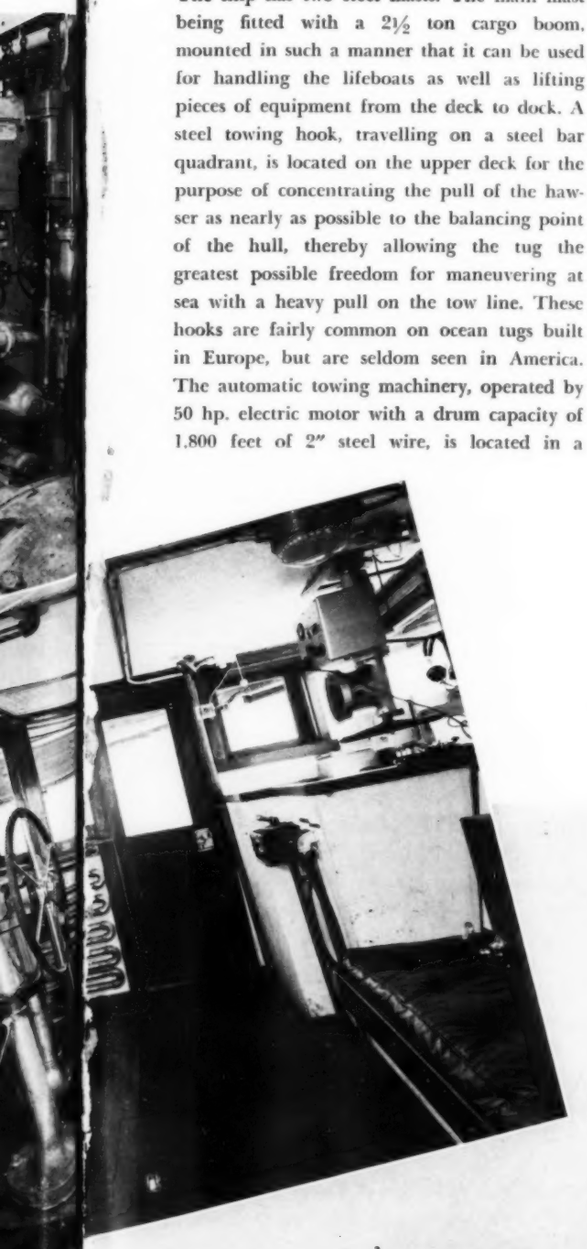
The ship has two steel masts. The main mast being fitted with a 2½ ton cargo boom, mounted in such a manner that it can be used for handling the lifeboats as well as lifting pieces of equipment from the deck to dock. A steel towing hook, travelling on a steel bar quadrant, is located on the upper deck for the purpose of concentrating the pull of the hawser as nearly as possible to the balancing point of the hull, thereby allowing the tug the greatest possible freedom for maneuvering at sea with a heavy pull on the tow line. These hooks are fairly common on ocean tugs built in Europe, but are seldom seen in America. The automatic towing machinery, operated by 50 hp. electric motor with a drum capacity of 1,800 feet of 2" steel wire, is located in a separate room at the after end of the main deck house. The steering gear control is entirely electric. The usual mechanical connections between wheel and steering engines have been entirely eliminated.

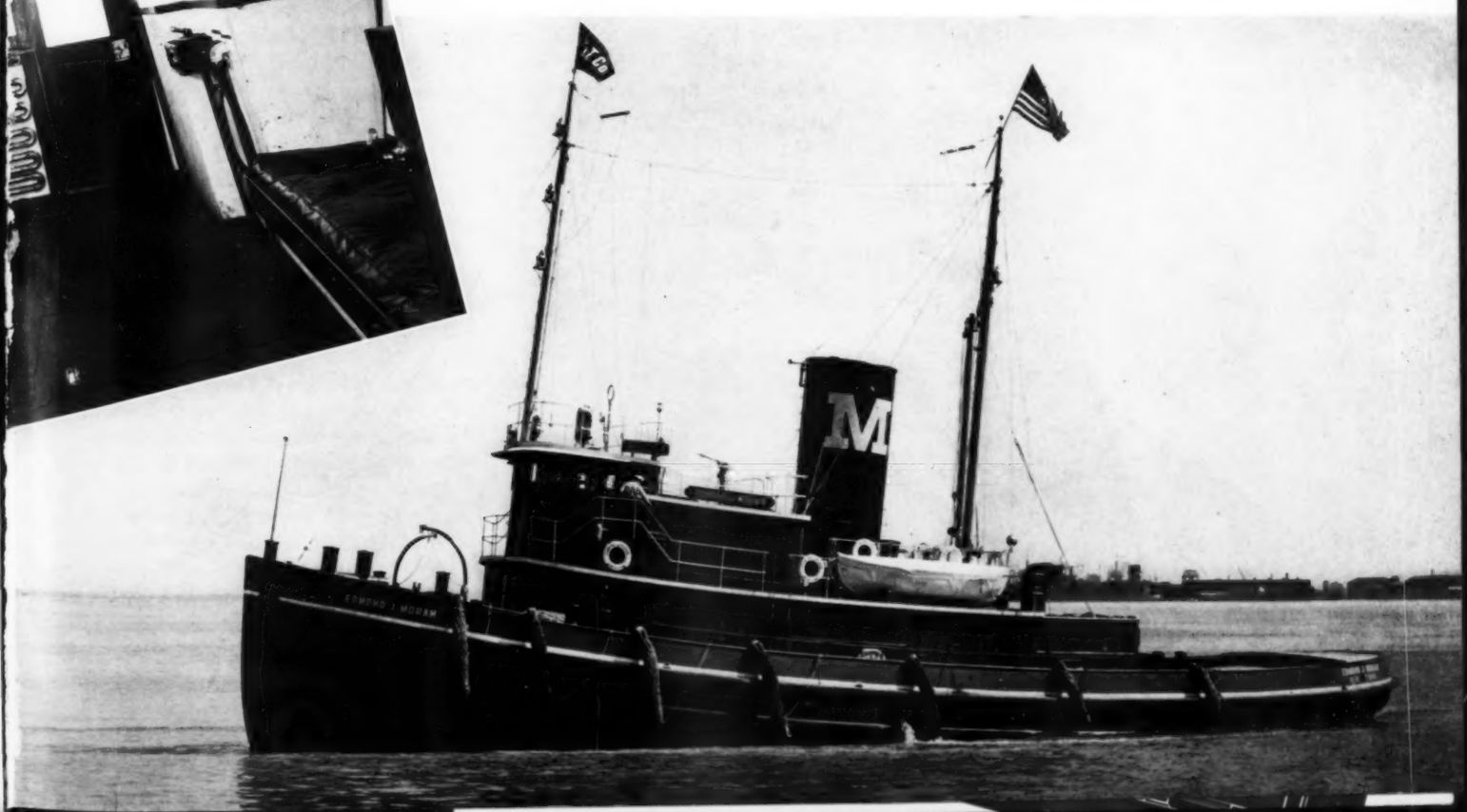
Accommodations for officers and crew are all forward of the machinery space. The galley occupies the full width of the deck house between the officers quarters and the upper engine rooms. Quarters for the crew are below the main deck and are unusually large and comfortable, far beyond legal requirements for space. Sides of the vessel and the deck overhead are heat insulated and each room is provided with a ventilating fan.

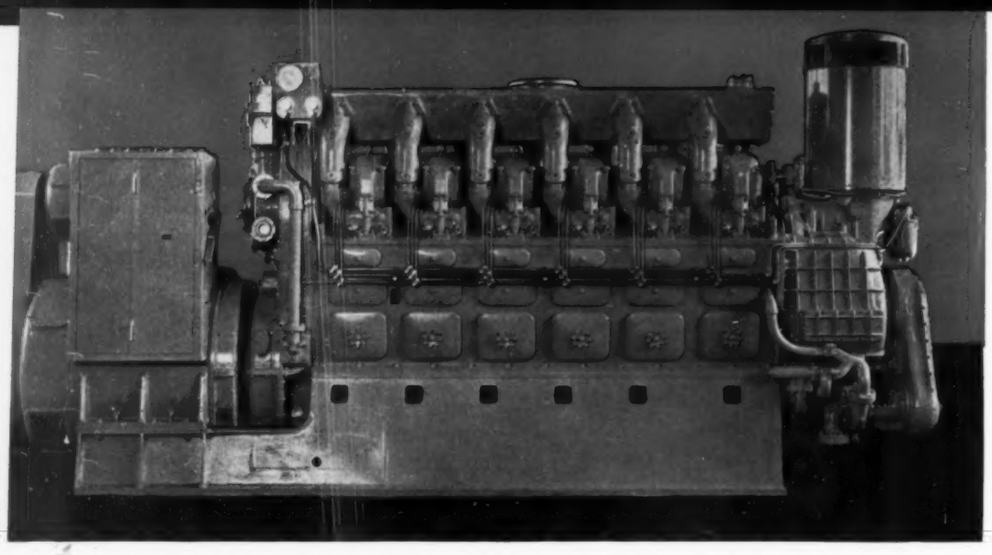
Except for the forepeak storeroom, every part of the vessel can be reached without going on deck. All openings in the deck house can be closed water-tight and the vessel operated entirely from within for an indefinite period. The ventilating system has been carefully worked out to this end. A steel enclosure has been built in the forward end of the deck house under the projection of the boat deck to afford shelter in bad weather for whomever may be stationed at that end as a lookout.

Each of the two main generating units is made up of a General Motors, two cycle, twelve cylinder Diesel engine, with two banks of cylinders opposed at an angle, bore 8½" and 10½" stroke. The engines are built on the new General Motors, two cycle streamline design and have uniflow scavenging and unit injection. A detailed description of this new General Motors, two cycle Diesel engine appears on the two following pages. Fresh and salt water pumps and lubricating oil pumps are attached to the engines. Each engine is directly connected to a generator developing 600 kw. at 600 volts direct current. Each main generator is provided with special machinery for starting the main engines from the storage battery. The engines are fresh water cooled but arrangement has been made to use salt water in case the fresh water pump is disabled. Emergency connections are provided so that either the fire or the bilge pump may act as a circulating pump. The main engine-generator sets are mounted on teak liners to absorb vibration. It is possible for the engines to deliver full power at 80 per cent propeller speed or at 160 rpm. This characteristic, whereby the torque is built up as the revolutions decrease thereby maintaining constant power, is one of the great advantages of electric propulsion for towing service. In direct drive power delivered is in direct proportion to revolutions.

The propelling machinery has three control points—from the pilot house, from the after deck, and from the engine room. Auxiliary power is furnished by two generator sets driven by General Motors 3 cylinder, 2 cycle Model 3-71 Diesel engines rated at 45 hp. at 1,200 rpm. close coupled to a 30 kw. 125 volt direct current generator. The engine room is completely sound insulated. The vessel is equipped with a direction finder, ship-to-shore-telephone, and both a long and short wave radio.







Broadside of the Model 12-278 two cycle engine as designed and built by the Cleveland Diesel Engine Division of General Motors Corporation.

THE NEW STREAMLINE GENERAL MOTORS DIESEL

THE engines in the *Edmond J. Moran* are new in so many respects that we are describing and illustrating them in some detail on these two pages. Designed and built by the Cleveland Diesel Engine Division of the General Motors Corporation, this Model 12-278 2 cycle streamlined V-type Diesel has a bore of 8½" and stroke of 10½" and a normal rating of 950 hp. at 750 rpm. The brake mean effective pressure is 70.1 lbs. per square inch and the piston speed is 1313 feet per minute. The diameter of the crankshaft is 7¼" and diameter of the crankpin 6¼".

The crankcase and cylinder block is a fusion welded steel structure in which great strength and great stiffness are combined with light weight. The combustion-gas load is transmitted as straight tension from the upper deck plate of each cylinder bank, through the inclined side plates, and to the forged feet to which the main bearing supports are bolted. These highly stressed members are made of a special welding quality alloy steel. The frame structure is rigidly braced by steel plate stiffeners between the main frame members. The completely welded monolithic assembly is stress-relieved by a carefully controlled heat treatment. The space between the upper and lower deck plates together with the V-shaped space between the two cylinder banks, serves as the scavenging air chamber.

The main bearing supports and caps are made of steel forgings. Each bearing support is securely fastened to the forged feet of the crankcase, by four heat-treated, alloy steel, through bolts. Each cap is held down on the bearing by a jack-screw, the upward thrust of which is taken on the crankcase frame, and which is securely locked in place. The bearing supports and caps are accurately held in the correct endwise and sidewise position. The main bearing bushings are made up of upper and lower bearing shells with no shims in the joints. The stiff double flanged steel backs of the shells are lined with a centrifugally cast, high-lead, bearing composition which contains a special hardener and which is known under the trade name of "Satco" metal.

The crankshaft is made of an alloy steel forging, and it is carefully heat-treated to develop the required physical properties. The shaft is subject to rigid inspection. The crankshaft is finished all over, and the main bearing journals and the crankpins are accurately ground to a fine finish.

The connecting rods are made of drop-forged and heat treated alloy steel. The rod is forged to an "I" section with a closed hub at the upper end, and with a cap at the lower end which is saw-cut from the rod forging. The piston-pin bearing in the upper hub is a cageless, three-row roller bearing of the "needle bearing" type, with a high load-carrying capacity. The outer race of the roller bearing has a creep-fit in the rod bore, so that the load and wear is distributed around the entire circumference of the bearing surface. The crankpin bearing is fitted with upper and lower bearing shells of the same construction as the main-bearing shells. The cap is fastened to the rod with four heat-treated, alloy steel studs.

The pistons are made of alloy cast iron. A cooling-oil chamber is formed by a diaphragm under the piston head. Pressure lubricating oil flows from the top of the connecting rod, through a sealing member, and into the cooling chamber. The oil seal is a spring-loaded shoe which rides on the cylindrical top of the connecting rod. The heated oil overflows through a drain passage.

The oil that drains from the side wall surfaces lubricates the piston-pin bearings. Each piston is accurately ground the full length of the cylindrical surface. Each piston is fitted with five compression rings above the piston-pin and with two oil scraper rings below.

The cylinder liners are made of close-grained, high-strength, alloy cast iron, and the casting strains are relieved by heat treatment. Each liner is uniformly cooled by the water jacket, the length of which is greater than the travel of the upper piston rings. The whirling action of the scavenging air streams to the top of the cylinder and results in very efficient scavenging. The cylinder bore is accurately honed to a very smooth finish. The joint between the liner and the cylinder head is sealed with a solid copper gasket, and the joint in the lower deck plate is made tight with rubber packing rings which permit the liner to expand and contract.

Each cylinder is fitted with an individual and easily removable cylinder head. The heads are made of the same material as the cylinder liners, and the castings are stress relieved by heat-treatment. The exhaust ports are completely water-jacketed.

Each cylinder head is equipped with four exhaust valves, the unit injector, the fuel oil filter, the overspeed injector lock, and the cylinder test and safety valves. Each cylinder head carries its individual valve gear, consisting of three rocker levers which are directly actuated by the camshaft through the cam-follower rollers. Two of the rocker levers oper-

ate the two pairs of exhaust valves and the third lever operates the injector.

The exhaust valves are made of special alloy steel which is remarkably resistant to the action of high-temperature gas. The four valves on each cylinder head are operated by two rocker arms, through two valve bridges. Each bridge is equipped with two rollers which transmit the rocker lever motion to the valves.

The fuel oil pump and the spray valve are combined in the unit injector to form a single compact unit, and each engine cylinder is equipped with a complete and independent injection system. The only moving parts are the plunger and the spray needle valve which is directly under the plunger. The quantity of highly compressed fuel under the plunger is too small to cause appreciable injection lag.

The pump plunger is moved, through a constant stroke, by the injector rocker lever. The cylindrical surface of the plunger is recessed to form two helical lips, and these lips close and open two ports in the pump bushing, and thereby begin and end the effective pumping stroke. When the pumping stroke has built up the required pressure, the spring-loaded needle valve opens and fuel is sprayed into the cylinder. The amount of fuel pumped is varied by rotating the plunger with a gear and a rack which is connected to the governor control. The plunger and bushing, and the needle valve and valve seat are made of a nitriding alloy steel, and they are heat-treated to produce very hard wearing surfaces that take a very smooth finish. These parts are lapped to a close working fit, so as to avoid appreciable fuel oil leakage under the high pumping pressure.

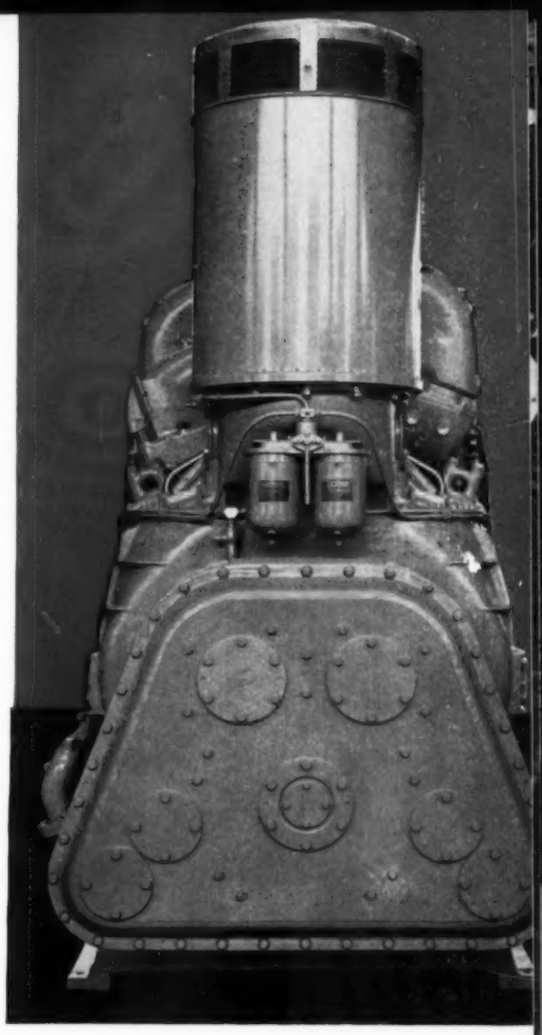
Each camshaft is made up of flanged and bolted sections. The cams are an integral part of each shaft section. The camshaft sections are made of case-hardened alloy steel. The contour of each cam is ground to an accurate duplicate of a master cam. The camshafts are driven from the crankshaft by a train of helical spur gears which are mounted on the generator end of the crankcase and cylinder block.

The regulating governor is of the isochronous, self-contained hydraulic type which is driven separately from the overspeed governor. The regulating governor is equipped for remote electrical control. The overspeed governor system consists of an overspeed governor and an injector lock mechanism on each cylinder head. When the maximum allowable overspeed is reached, the governor pump builds up oil pressure which acts against the pistons in the injector lock cylinders and moves each injector plunger to the lower end of its stroke. This shuts off all fuel injection and stops the engine.

The scavenging air is furnished by a positive displacement blower of special construction. The blower housing and the two rotors are made of heat-treated aluminum alloy castings. Each rotor is made with three helical lobes to produce a continuous and uniform flow of air. All parts of the blower are very accurately finished to insure highly efficient operation. The blower is driven from the crankshaft through a flexible shaft and helical spur gears. The intake air is muffled by a specially designed silencer.

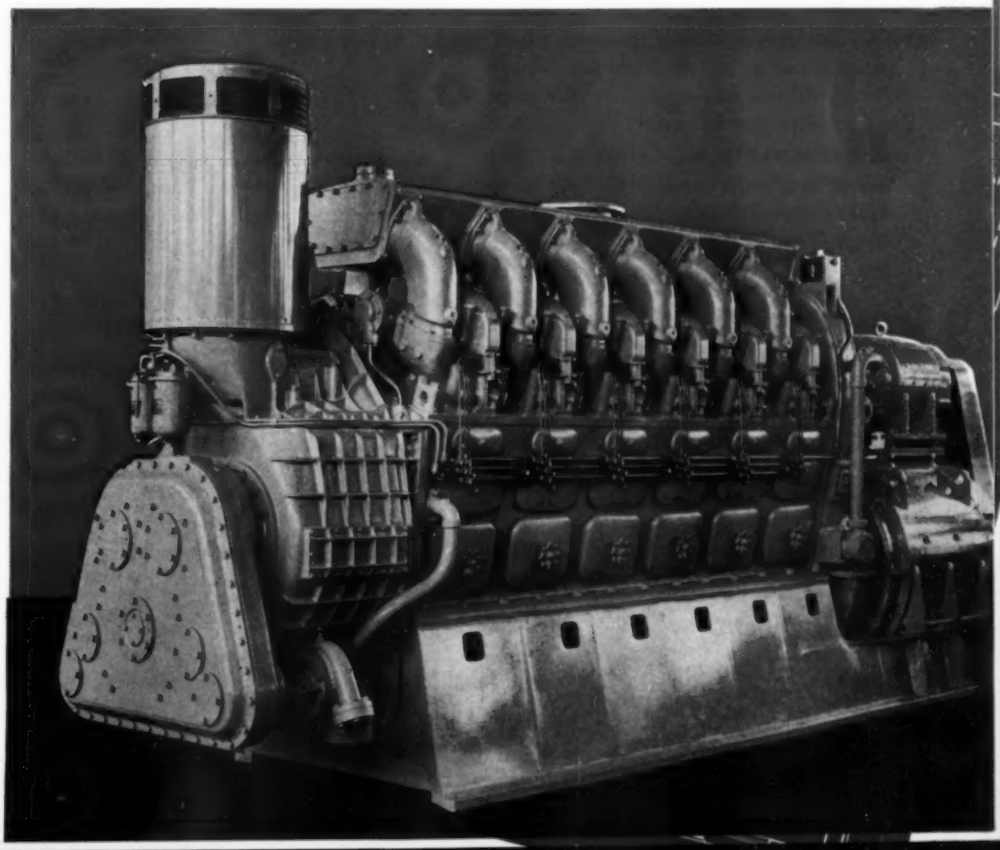
The exhaust from each cylinder passes through an individual water-jacketed elbow, into a water-jacketed manifold which is common to all of the cylinders. The exhaust manifold is made of mild steel which is fusion welded into a one-piece structure. All of the surfaces of the manifold are hot-dip galvanized to resist corrosion.

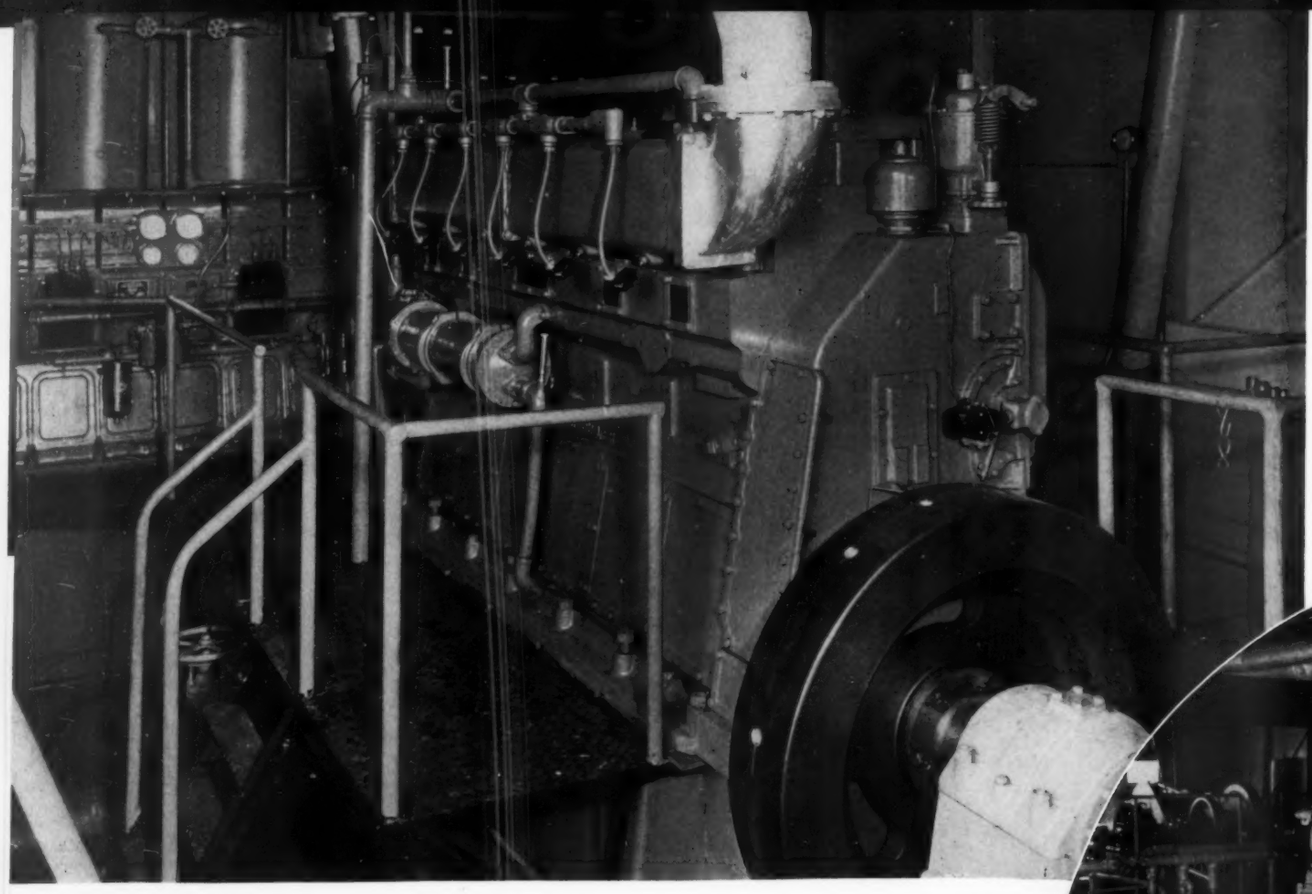
Oil for the pressure lubricating system is circulated by two positive displacement pumps which are driven from the helical spur gear train at the generator end of the engine. The scavenging pump draws returned oil from the engine oil pan, forces it through the filter and through the cooler, and then delivers it to a sump tank. The pressure pump draws the oil from the sump tank and delivers it to the manifold which distributes it to the various parts of the engine.

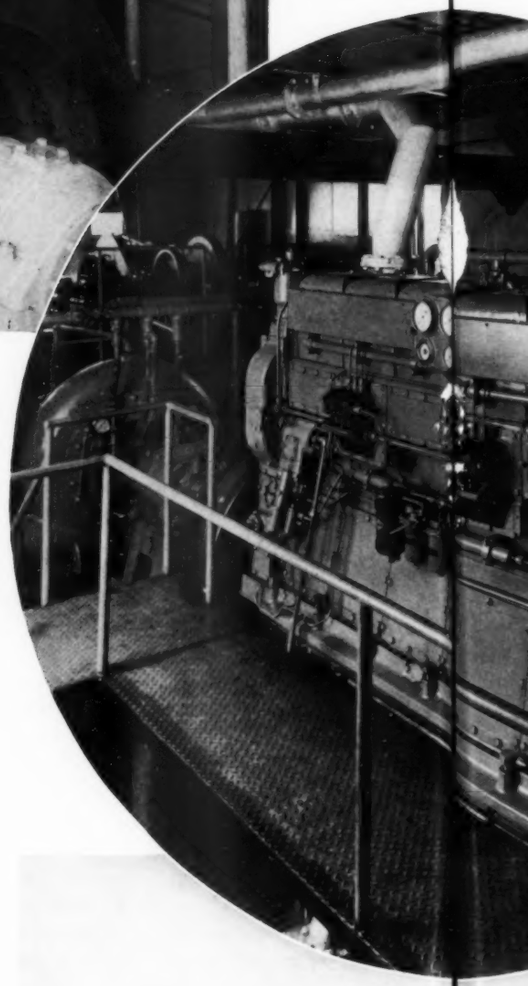


Scavenging blower end of the Model 12-278 General Motors two cycle Diesel.

Quartering view of the new General Motors Model 12-278 General Motors Diesel.







DIESEL DREDGE "BRADLEY CARR"

By WARREN GLEASON

RECENTLY constructed and immediately rushed into active service, the new dredge *Bradley Carr* is busy winning credit for her designers and builders and making profit for her owners and operators.

Built in New Orleans by the Lester F. Alexander Company, Inc., for the Calmes Construction Company of Baton Rouge, Louisiana, the hydraulic plant of the *Bradley Carr* was designed to meet the three somewhat different requirements of dredging either gravel, shell, or sand; as well as the usual work of channel-digging. Concerning the measure of performance, it is sufficient to mention that in the heavy job of shell-dredging, the operators found it necessary to run the pumping motor at reduced speed, production being so fast and constant that the barges were unable to handle the volume of shell produced at full throttle.

Two big Diesels form the main power plant of this able dredge, both these being engines made by the Cooper-Bessemer Corporation.

One Diesel is used exclusively for driving the dredge pump. This pumping engine is a Cooper-Bessemer six cylinder 10½" bore by 13½" stroke. It is rated conservatively by the manufacturers at 350 hp. at 500 rpm, though according to the Calmes Engineering Company, distributors for the engines in the New Orleans

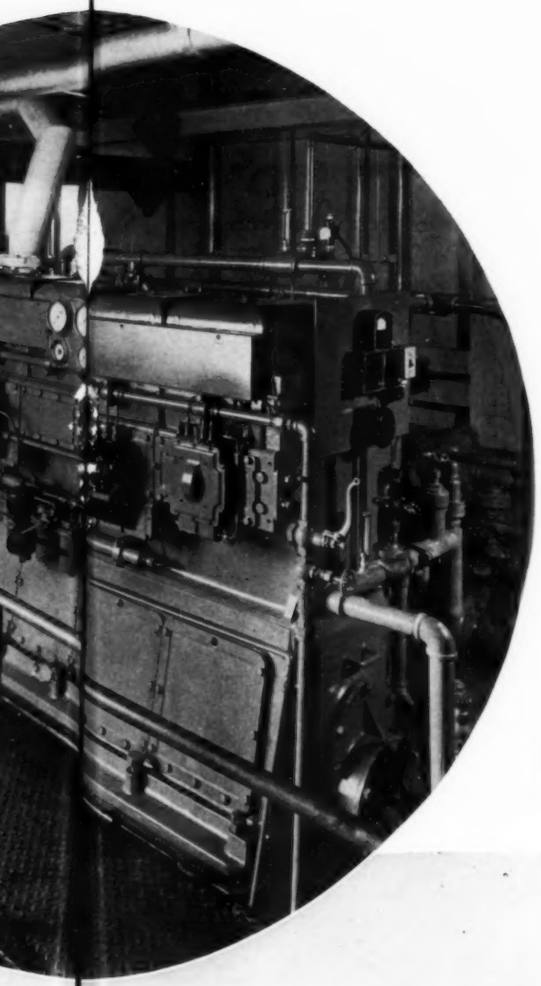
trade area, 385 usable hp. is actually produced in this installation.

The main dredging pump, a 15" suction pump built by the American Manganese Company, is connected to the Diesel by use of the Falk spring-type coupling.

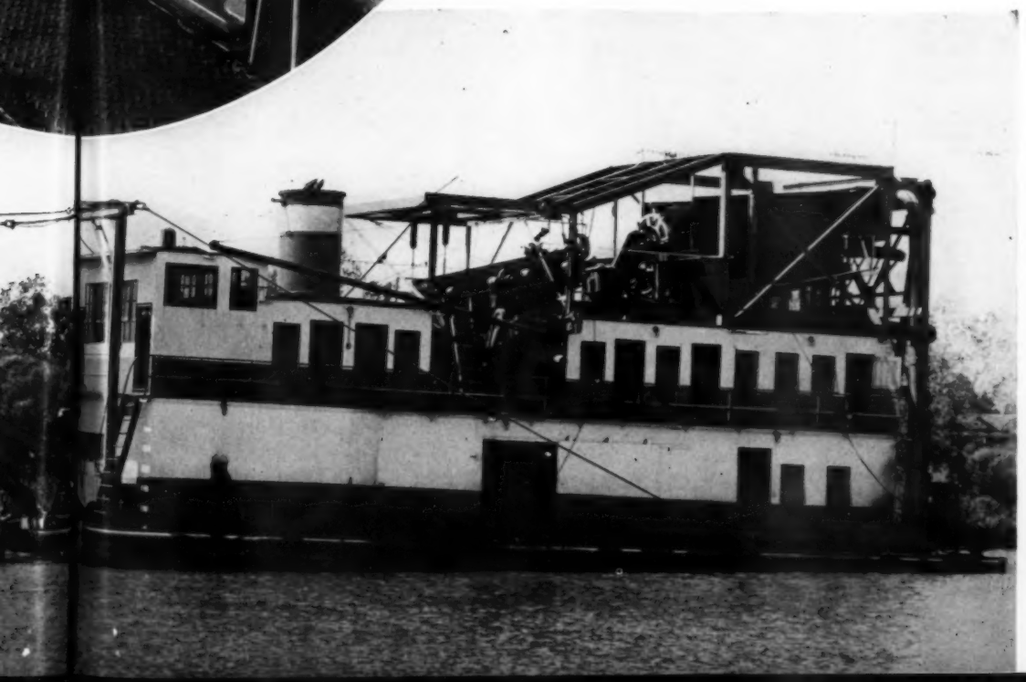
A Type EN Cooper-Bessemer engine, of six cylinders with a bore of 8" and a stroke of 10½", rated at 225 hp. at 700 rpm., is also installed. This second Diesel drives a Westinghouse 150 kw. generator, supplying current for the pieces of heavy-duty equipment, all of which are equipped with individual motors. Such machinery includes service pumps, cutterhead motor, cooling water pumps, boiler supply pumps for the screening system and fuel oil transfer pumps. All auxiliary pumps are of Dayton & Dowd make; all electrical equipment, including generator, exciter, motors, switchboard and so on, is Westinghouse.

Equipment on the main engines includes a Briggs Clarifier for filtering and reclaiming lubricating oil and a Purolator filter for fuel oil. Lube oil is cooled by a Cooper-Bessemer built-in cooler. Thermostat control valve and lube oil pressure alarms are Fulton-Sylphon; Burgess exhaust snubbers are used; exhaust pyrometers are Wheelco. The closed system for cooling water is employed, the heat exchanger being the product of the Young Radiator Company. U. S. gauges and Crane valves are standard.

Fuel is injected by the patented Cooper-Bessemer Controlled-Pressure system, which offers certain advantages over constant-pressure systems. In the Cooper-Bessemer injection cycle, the pressure at each nozzle is reduced between injection periods. Fuel pressure to suit engine loads and speeds is automatically regulated, and dribbling at the spray-nozzles between injections is eliminated. This results in appreciable fuel savings, a clearer exhaust, less carbonization and less dilution of lube oil with corresponding longer life to piston rings and cylinder liners.



Top left: Exhaust side of the main dredge pump Diesel with the generator Diesel showing in left background. Center: Control side of the dredge pump engine.



The fully Diesel equipped hydraulic dredge, "Bradley Carr".

Pistons are of aluminum alloy, with seven rings each. Another practical Cooper-Bessemer feature is the patented wrist-pin bearing construction, which permits the top of the wrist-pin for its entire length to be used for bearing area, again making for longer life and fewer repair bills. Too, Meehanite metal is used for all iron castings in the motors instead of the usual cast iron, with greater strength, higher speed operating possibilities and lighter weight as a result.

These engines with their neat one-piece cylinder blocks and freedom from exposed moving parts such as rods and rocker-arms and the like are things of beauty, remarkably quiet in operation. There is nothing of frailty in construction: the 7½" diameter crankshaft in the Type GN and the 5½" shaft in the lighter EN model giving more than a hint of sturdy strength.

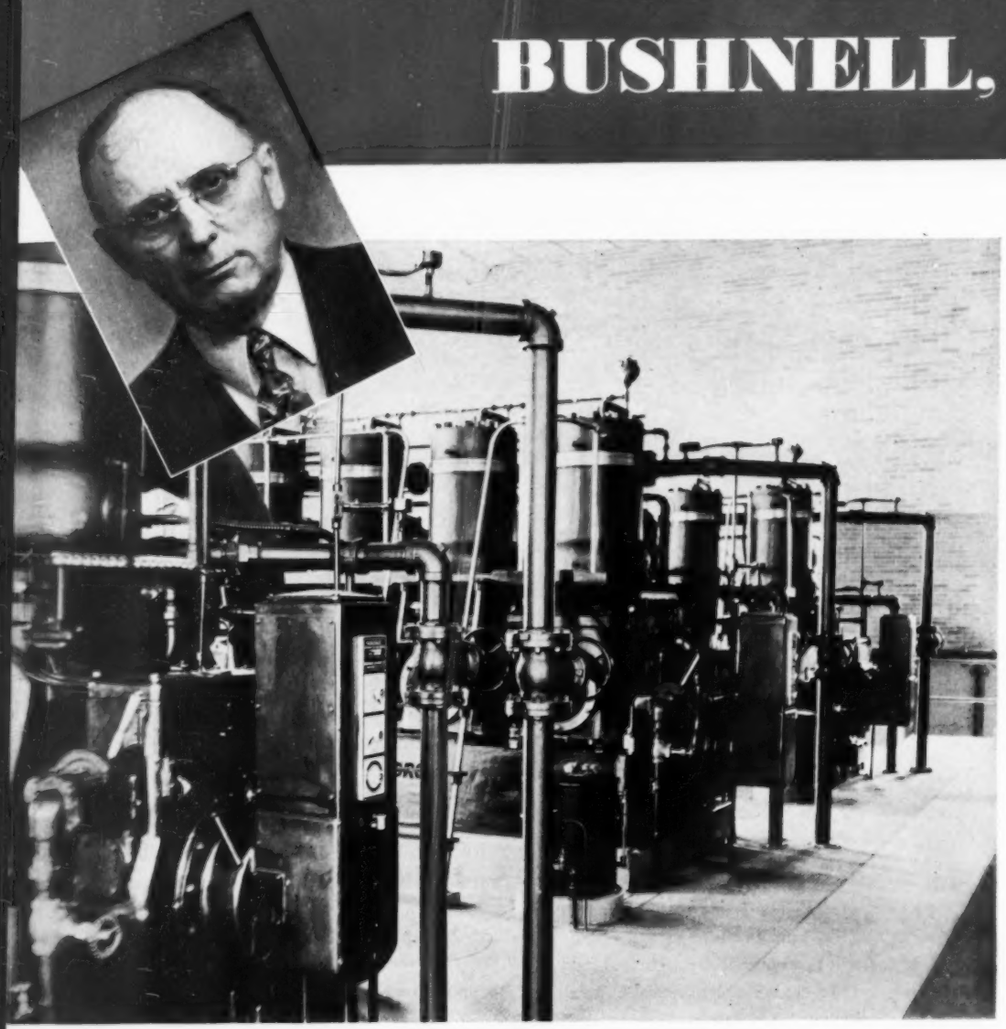
Starting is by compressed air, using a Schramm compressor driven by a small auxiliary Diesel; this engine being a one-cylinder Lister, of 6 hp. at 650 rpm. This little Diesel also drives a 3 kw. generator, providing current for lights, electrical refrigeration, hot and cold water systems in the galley and toilets, and pumps for hot and cold showers.

In appearance as in performance, the *Bradley Carr* is outstanding, clean and shiny as a liner. The hull, measuring 80′ in length, 30′ in beam with a draft of 4′ 6", was designed by the Calmes Construction Company of Baton Rouge; the entire engine-room layout was designed and installed by the Calmes Engineering Company of New Orleans.

The hull is of all-steel construction, well screened and ventilated for use in the marshy lakes, with yacht-like cabins and accommodations for two officers, three engineers and eighteen members of the crew. Separate bathrooms are provided for officers and crew; there is one mess, served by a most modern galley with a Webb oil-burning range. Gasoline has no place aboard this boat.

Operation of the dredging equipment has been simplified and centralized all possible. Lifting of ladders, swinging spuds and swinging hoists are all managed by American Hoist and Control instruments located in the Control-room. No propulsion mechanism is installed.

BUSHNELL, ILLINOIS.



View of the three new F-M 300 hp. Diesels. Insert: Mayor George L. Porter of Bushnell.

By HENRY J. BARBOUR

WHEN, on July 11, 1940, the City of Bushnell, Illinois, began serving some 600 of their local townspeople with electric light and power generated by their new Municipal Light and Power Plant, "finis" was written on one of the most dramatic fights that has ever taken place between a civic government and a public utility.

It all started back in the spring of 1937 when George L. Porter, Manager of the Farmer's Cooperative Elevator Company, was persuaded by a group of enterprising citizens to run for mayor on a business administration platform. Having been born and raised in Bushnell, Mr. Porter accepted the challenge of the opposition and immediately issued a five-point platform, brief, unequivocal and to the point.

First, he promised to seek lower electric rates for power, commercial and residential consumers—to plan for manufacture of electric current to pump water and to light every street light (not every other corner) if the city was unable to obtain a new contract with the local light company that would bring the city well lighted streets at a price it could afford to pay. Second, he promised to seek Federal aid on new projects to afford work for those who unfortunately were idle.

Then he promised to clean the streets regularly and, fourth, to seek the cooperation of all other officials, city, county and state in order to make Bushnell a better city in which to live. Fifth, he promised a business administration by a successful business man, a type of government which had been lacking in the City of Bushnell for some time previous to his now successful regime.

Naturally with the gauntlet flung before them, the utility company serving the city immediately got busy to help defeat him—and the Battle of Bushnell was on—but Mr. Porter was elected by a large majority. Following his induction into office, Mayor Porter and his City Council attempted to secure a satisfactory rate from the local power company. He further insisted that the power company live up to its present agreement to keep in good condition the standards and lights on the main streets. These had been allowed to remain unpainted for a number of years. Many standards were broken or leaning at a disreputable angle, globes were broken, lights were burned out and not replaced. In short, the whole "whiteway" system of main street had gone almost to "wrack and ruin". After considerable argument and many conferences, a satisfactory rate was forthcoming, but with it the power company introduced a new franchise calling for a period of fifty years. This was promptly rejected by the mayor and council.

A few days after the rejection of the rate schedule and franchise, a decision was handed down by the Supreme Court of Illinois which made it possible for cities in Illinois to market utility certificates. When this good news reached the mayor, he and his fighting council proceeded at once to have a report made which was to be studied with the view in mind of building a municipal light and power plant, complete with distribution system. Warren & Van Praag, Inc., Consulting Engineers of Decatur, Ill., were employed to make the preliminary report. Immediately the council and mayor visited a number of municipally owned plants, both in the State of Illinois and Mis-

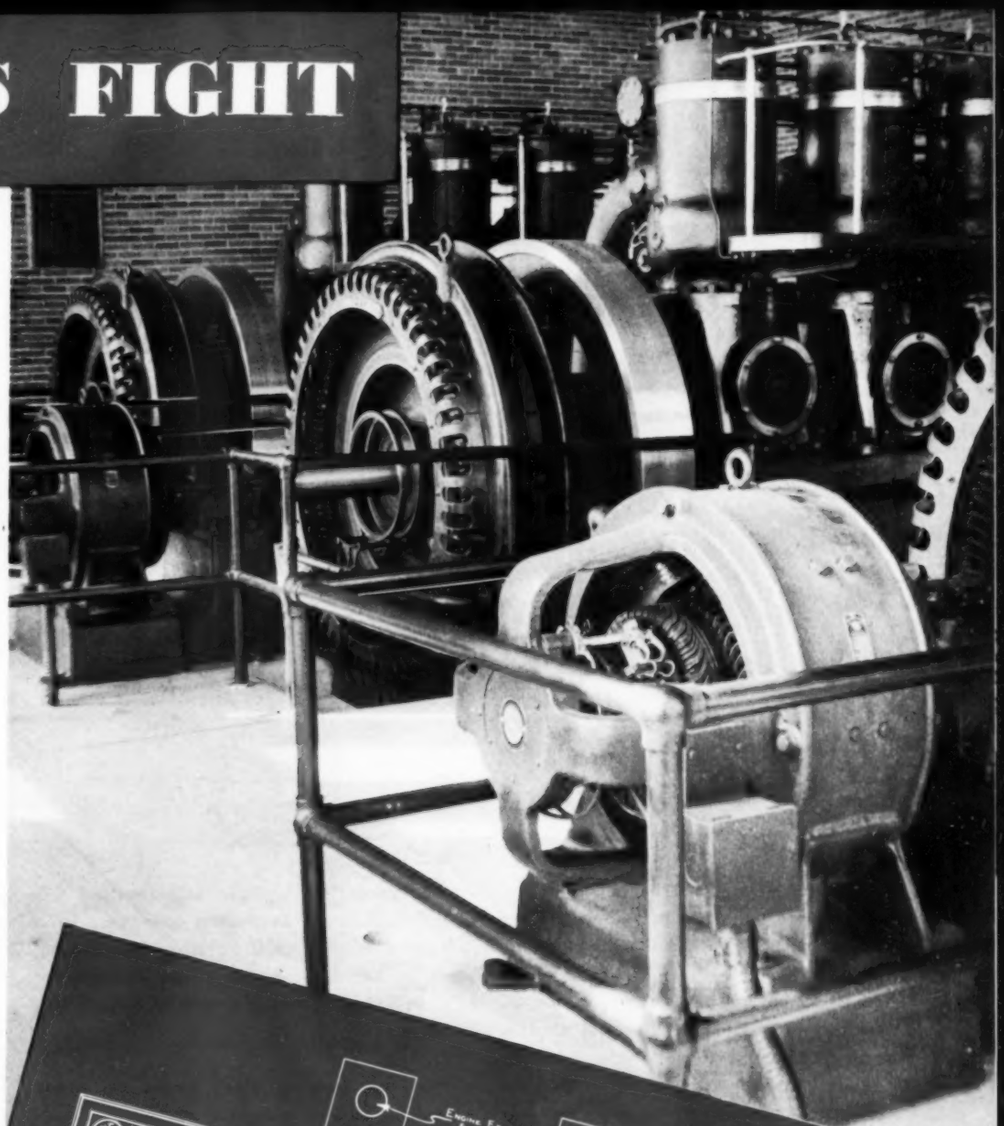
The three large Maxim exhaust silencers. Note American air filter.

WINS ITS FIGHT

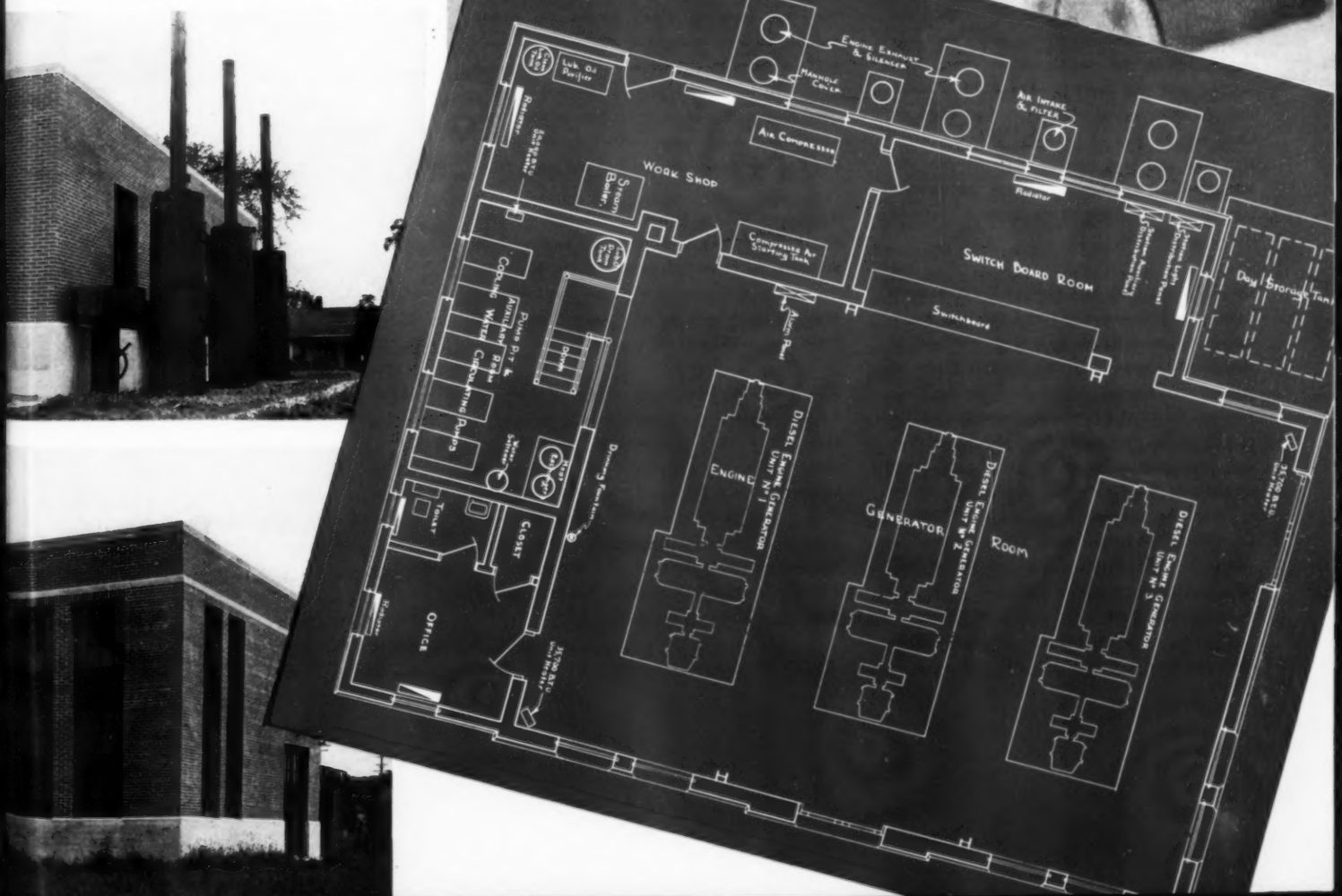
souri, among the number being Jacksonville and Geneseo, Illinois.

A mass meeting was held November 22, 1937, for the purpose of explaining to the public the results of the investigation of the light and power situation in the City of Bushnell. The power company representative was also present and gave his side of the story. Early in March, 1938, the City Council then took the required steps, legal, engineering and otherwise, to secure the construction of their municipal light and power plant and distribution system. Warren & Van Praag, Inc., were continued as engineers and R. E. Lybarger of Bushnell and Orville N. Foreman of Jacksonville, were retained as attorneys. An option on the land on which the plant was to be erected was procured and an application for a P.W.A. grant was made.

The next few months brought more fireworks to the people of Bushnell than they had ever experienced on any previous Independence Day. The power company went into action



View showing generator ends of the three units. →



The operating personnel: Robert Cadwalader, Lester Roos, plant foreman; Arthur Perrier, Supt. of Municipal Light Company; Warren Fisk, and John Snell.

with the usual line of argument to smoke-screen the public. Charges and counter charges flew thick and fast. Advertisements against municipal ownership signed by a "Citizen's Committee" appeared in the local newspaper. The light standards on main street were cleaned, repaired, straightened up, and freshly painted. New globes replaced the broken and cracked spheres. New bulbs replaced burned out lights. In short as Mayor Porter laughingly puts it, now that the matter is history, "They tried their darndest to gild the lily".

The first election lost by 62 votes was followed about six weeks later by a second election which was favorable to municipal ownership by 41 votes. On the evening of the election, the ballots were impounded by the power company and placed in the custody of the court. Two months later the court handed down a favorable decision, ruling that there had been no fraud on the part of the city. This happened at 2 p.m. and at 6 p.m. of the same day, the Mayor and his still-fighting council were handed a summons issued out of the District Court of the United States.

On April 12, 1939, the Federal Court handed down a favorable decision and this was immediately followed by an appeal on the part of the power company in the Circuit Court of Appeal in Chicago. Again the City of Bushnell was rendered a favorable decision on January 12, 1940. Two weeks later the power company served a summons on the City Council and the Monroe Electric Company asking for a permanent injunction. In the meantime, as all these legal tactics were being carried on, the City had received a P.W.A. grant of $96,750 and construction of the new plant had been carried on since the middle of December, 1939. The plant was carried to final completion and service started July 11, 1940.

And that is the story behind the new Municipal Light and Power Plant now operating in the City of Bushnell—a tale of genuine accomplishment brought to a successful consummation by an intelligent and aggressive leadership of a fighting mayor and as equally a fighting City Council who refused to be intimidated and did now know the meaning of the word "quit".

The several photographs accompanying this article illustrate the physical properties of the project, but only the foregoing brief resume of the "Battle of Bushnell" can illustrate the moral fiber of the city fathers behind this plant.

The new building which houses the power equipment is of functional design, not ornate but attractive in appearance. It is constructed of pressed brick with poured concrete foundation, approximately 51 x 62 feet in size, with a depressed pump room located at the left side and 3½ feet below the level of the main floor.

This room is 11 x 21 feet in size and is immediately behind the Superintendent's office which occupies the front left corner of the structure. The plant is equipped with a 5-ton overhead hoisting crane built by the Conco Engineering Works of Mendota, Illinois.

The generating equipment consists of three 300 hp. Fairbanks-Morse Diesels, each of four cylinders, 14" x 17", operating at 300 rpm. and using direct airless-injection of fuel, backflow scavenging and the two-stroke cycle principle. Each engine is direct-connected to a 255 kva.—204 kw., 3 phase, 60 cycle, 2400 volt, 300 rpm. engine type high efficiency alternators and 7½ kw. direct-connected exciters—all products of Fairbanks, Morse & Company.

The starting system consists of a Gardner-Denver vertical duplex, two-stage air-cooled, air compressor belted to both a 3 hp. Fairbanks-Morse gasoline engine and a Fairbanks-Morse 2 hp., 3 phase, 60 cycle, 220 volt, 1800 rpm. electric motor—for dual drive—and a battery of three air starting receivers equipped with air gauges and safety valves, built by the Diesel Plant Specialties Co.

The eight-panel Westinghouse dead front switchboard.

The fuel oil used is furnished by the Standard Oil Company API 27.9 gravity costing $.0485 per gallon. The fuel economy is above 12.5 kw.-hr. per gallon at the average load and the efficiency of the plant affords a considerable savings over purchased electric power.

A two inch single pipe unloading rack furnished by Morrison Brothers is used with a 1½ inch Fairbanks-Morse industrial rotary pump geared to a 3 hp., 3 phase, 60 cycle, 220 volt, 1800 rpm. electric motor, also F-M.

Two 10′ 6″ diameter by 23′ 7″ long fuel oil storage tanks, each having a capacity of 15,000 gallons are located near the railroad track

The Marley atmospheric spray raw water cooling tower.

about 75 yards from the main building. Storage tanks were furnished by the Graver Tank & Manufacturing Co. Three 300 gallon capacity fuel oil day tanks each equipped with a Niagara oil meter are ingeniously located just outside the building, the pits for which are covered with corrugated steel plates. Hinged manholes are located over each meter so they can be easily read by the operators. Three Midget Levelometers are located on the wall inside the plant so that the level of the fuel oil in each day tank can be determined at any time. These were furnished by the Liquidometer Corporation.

The water cooling system is designed as a closed cooling system and has been carefully engineered to insure maximum safety and freedom from scale in the jackets. A Graver Tank & Mfg. Co. water softener provides a reliable source of soft water for make-up and is operated periodically, being a Zeolite system long used for this purpose. A battery of five 3-inch single stage, split-case, centrifugal pumps each direct-connected to 5 hp., 3 phase, 60 cycle, 220 volt, 1800 hpm. motors is located in a special pump room located to the left of and below the main floor of the engine room. Two of the pumps are used in the raw water circuit; two are used in the soft water circuit while the center pump is so piped that it can be used in either circuit. An ingenious color system is also used in the pump room. Pipes and pumps carrying the soft water are painted light blue and dark blue is used on those carrying the raw water. The middle pump is painted in both colors. All pumps and motors are furnished by Fairbanks-Morse. The cooling tower for the raw water is the regular Marley atmospheric spray type, while two Ross shell and tube type heat exchangers are used in the soft water cooling system.

An efficient oil filter is provided as an integral part of the lubricating system and positive circulation of lubricating oil through this filter assures clean oil and increases dependability. The used lubricating oil is purified by means of a 5 gallon Renuoil Purifier with automatic heat control furnished by the Diesel Service Company.

The air intake and exhaust system is simple and efficient. The exhaust connects directly to three No. 24 (one for each engine) Maxim Exhaust Silencers mounted on concrete bases, and the air intake header connects to American air filters located between the exhaust silencers as shown in the illustration.

The switchboard and switchgear is the standard Westinghouse Electric, fully equipped with Allis-Chalmers rocking contact regulators and the necessary instruments, meters, etc., and is of the modern dead front type. The disconnects are located on the front side of the board at the top of each panel in place of the rear. Eight panels are now in place with room for additional panels should added power be required in the future. Three 10 kva. transformers for plant auxiliary service and two 10 kw. regulating transformers are installed for the city's street lights. These, too, are Westinghouse. The entire plant is protected with the latest system of alarm signals consisting of red lights and a siren horn. There are three Alnor pyrometers mounted on the signal panel, one for each engine.

The distribution system was installed by Monroe Electric Company, Chicago, while Pat Tiernan of the Tiernan Engineering Company, Bushnell, Illinois, was the City Engineer who supervised construction of the plant.

"ST. PAUL SOCONY"

By GEORGE D. CROSSLEY

ON August 10, gaily bedecked with flags and bunting and with the traditional champagne glistening on her bow, the towboat *St. Paul Socony* slid down the ways at the Decatur, Alabama, shipyard of the Ingalls Shipbuilding Corporation. Sponsored by Mrs. Ray Ruben Irwin, the launching was highlighted by a short address by Mr. David E. Lillienthal, director of the Tennessee Valley Authority in which he lauded the cooperative spirit of both Government and private enterprise in making this achievement possible. Mr. Lillienthal expressed the thoughts of many when he said, "Navigation of the Tennessee River has become a reality and a century of effort to make the Tennessee a navigable stream has at last come to fruition."

Built in the heart of the Tennessee Valley Authority district and designed especially for river service between St. Paul, St. Louis, and Kansas City, the *St. Paul Socony* has now joined the ever-growing river fleet of the Socony-Vacuum Oil Company. The continued success and expansion of Socony's petroleum distribution service on the Mississippi and Missouri Rivers demanded additional equipment, resulting in the purchase of this new towboat to take her place with Socony's two other Diesel towboats, the *Kansas City Socony* and the *St. Louis Socony*, already well-known to river men. The *St. Paul Socony* is considerably larger and more powerful than its two predecessors and with its rating of 1500 hp., it will be one of the most powerful Diesel river towboats in existence in this country. Embodying many improvements gleaned from experience with its predecessors, the new vessel was completely designed in the Socony-Vacuum marine department. Even a cursory inspection of the boat will impress one with the fact that intelligent spending has not been spared to make this towboat one of the finest on the river. The completeness of its mechanical features is balanced by the comfort and appointment of the quarters. The hull is of the twin screw tunnel design with modified scow bow and has the following dimensions: length molded 147 ft., beam molded 35 ft., depth molded 7 ft. 6 in., load draft 5 ft. 4 in.

The main propelling machinery consists of two eight cylinder, Superior Diesel engines developing a total of 1500 hp. at 300 rpm. Each of the main engines is controlled by a single lever which not only acts as a throttle, but also controls the reversing of the engine. The two levers are mounted at a central control station in the forward part of the engine room so that the engineer on duty may be close to the generator and compressor units.

The generating equipment consists of two Superior vertical four cylinder, 75 hp. at 650 rpm., 7 x 9 marine Diesel engines, driving two 50 kw. generator sets which provide current for the electric galley and all the auxiliary machinery. Each auxiliary Diesel and its generator are integrally mounted on a common steel base which is isolated from the structure of the ship by Korfund steel spring Vibro-Isolators.

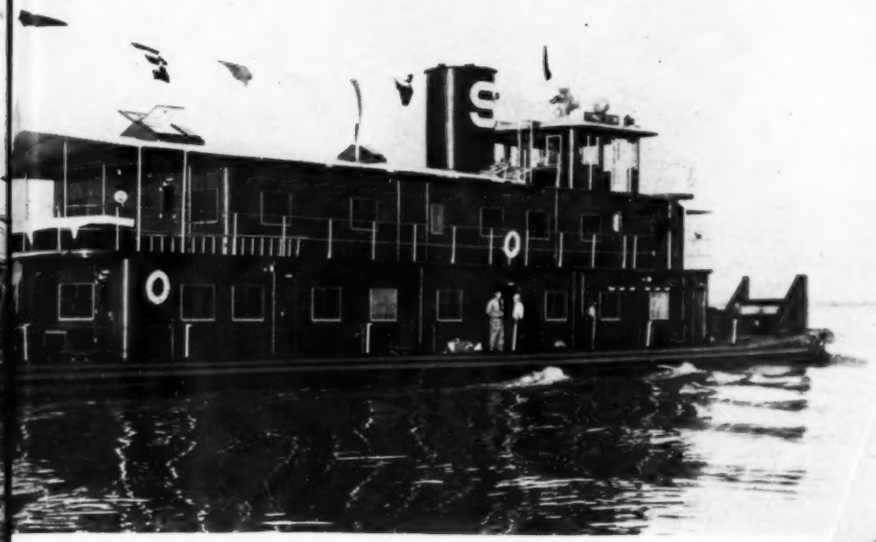
Worthy of special note is the unusual arrangement for water cooling of the main and generating engines. Two complete separate and independent systems are installed, each system consisting of heat exchanger and raw and jacket water pumps. The systems are so connected and of such capacity that each system in case of emergency is capable of furnishing the entire cooling requirements for the boat. The two heat exchangers were furnished by the Condenser Service and Engineering Company and each pumping unit consists of two 4-inch centrifugal pumps manufactured by Weinman Pump Company and driven on a common shaft by a Century 15 hp. mica-insulated marine type motor. This arrangement guarantees adequate cooling water under all conditions and has the advantage over attached engine pumps in that the cooling systems can be run after stopping the main engines, thus providing proper cooling for the machinery. Additional accessory equipment includes Maxim silencers, Worthington air compressors, and Crane Company pipe, valves, and fittings.

Comfort for the officers and crew in cold weather is guaranteed by a complete steam heating system consisting of an American Radiator heating boiler installed in the engine room between the two main engines. The furnace is fired by a Silent Glow oil burner and Shaw Perkins convector type enclosed radiators are installed throughout the quarters. Somewhat unusual are the three separate water systems for wash, sanitary, and drinking water. Each system is complete in itself, consisting of a storage tank and an automatic electric-driven pressure water set supplied by Crane Company.

Of special interest on the new towboat is the provision made for the comfort of the personnel through the introduction of forced air circulating facilities. An exhaust ventilating system takes the air away from under the ceiling and the sheathing space throughout the accommodations is vented to circulate the air between the house insulation and the sheathing as an assistance in maintaining an equitable temperature in the rooms. Forced ventilation throughout the engine room, also, assures comfortable working conditions under all temperatures.

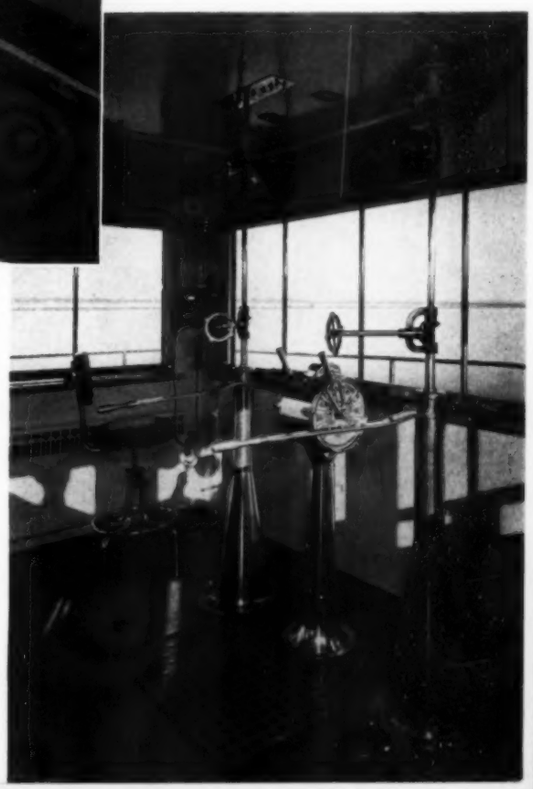
A high degree of maneuverability is essential for vessels operating on the inland waterways, and this point has been stressed on the *St. Paul Socony*. There are four rudders, one forward and one aft of each of the twin-screws, with the rudders being so connected that the two on each side, fore and aft, act together.

In addition to this, the controls may be interlocked so that all four rudders can be operated by one lever. Thus, the pilot at all times may be assured complete control of the vessel. After completion of successful dock and running trials on the Tennessee River during the first



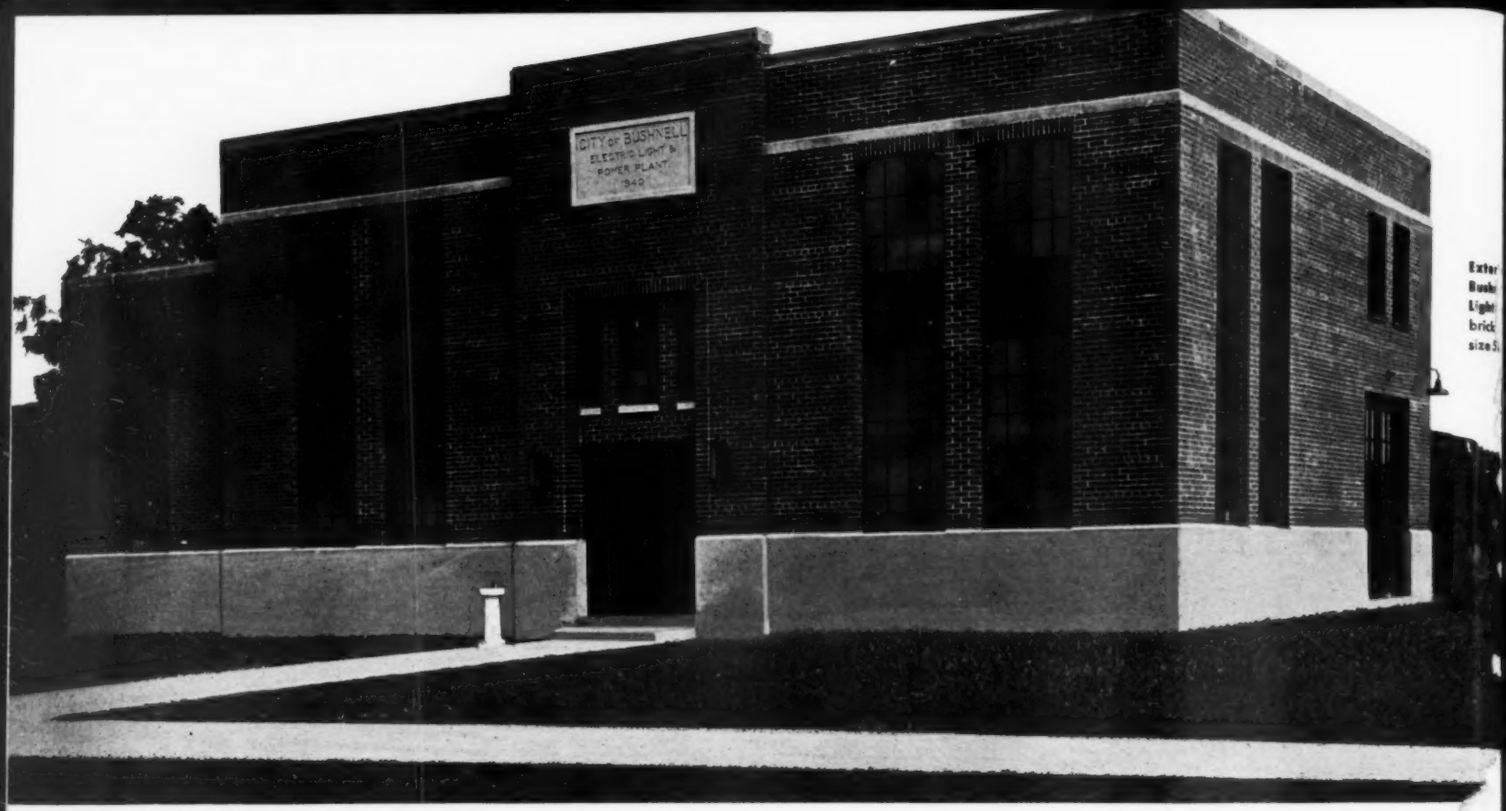
The engine room of the "St. Paul Socony", shown above, with the two 750 hp., eight cylinder Superior Diesels in the foreground and the two 50 kw. Superior Diesel generating sets in the background, the latter mounted on Korfund Vibro-Isolators. One of these 750 hp. Superior Diesels is shown at the right on its way to the engine room.

The pilot house of the new towboat, the "St. Paul Socony".



week of October, the *St. Paul Socony* left Decatur on its delivery trip to St. Louis. Of special note during trials was a decided lack of unpleasant vibration throughout the boat when under way at near top speed.

With her glistening red deck house, bright green deck fittings and elaborate equipment, the *St. Paul Socony* was the subject of considerable complimentary comment as she passed through the locks going down the Tennessee. The most powerful and elaborate boat ever to be built on the Tennessee River, she should be Socony's most successful towboat and a source of pride for many years to come, both to the owners, Socony-Vacuum Oil Company, Inc., and her builders, the Ingalls Shipbuilding Corporation.



Bushnell in Line for Diesel Dividends . . .

EARNINGS OF NEW MUNICIPAL LIGHT PLANT INDICATE NET PROFIT OF $15,000 ANNUALLY

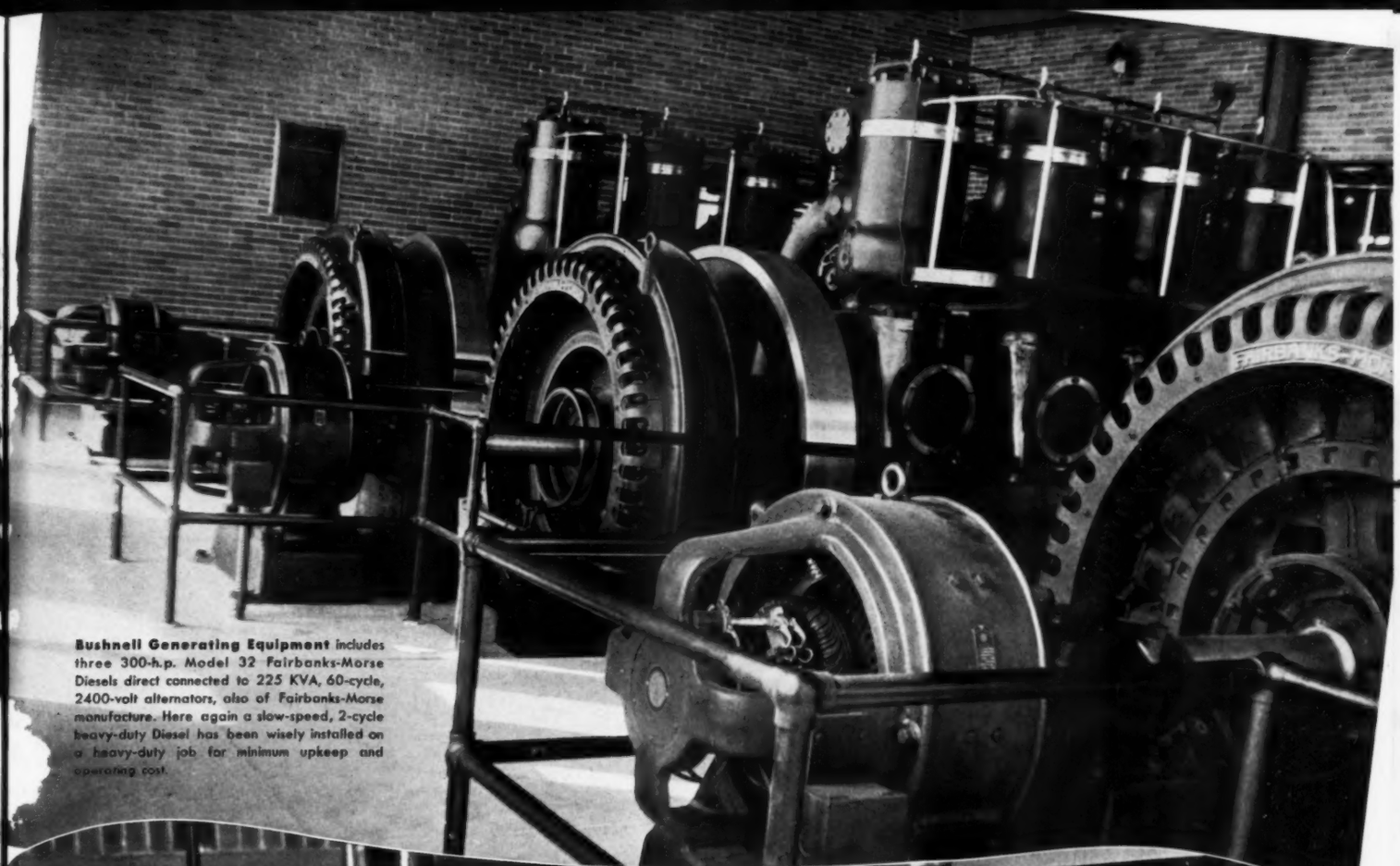
On the basis of collections received for the first 30 days of operation, the new municipally owned power and light plant at Bushnell, Illinois will have $42,000 during the first year of operation and will earn a net profit of $15,000! Operating expenses have been liberally estimated at $18,000 per year. Bonded indebtedness and principal obligations total only $9000 a year—which leaves $15,000 to be used for civic improvements or for whatever the citizens of Bushnell may desire.

Although this plant has been in operation only since July 11, 1940, more than 63% of the possible customers in Bushnell have already signed up for service.

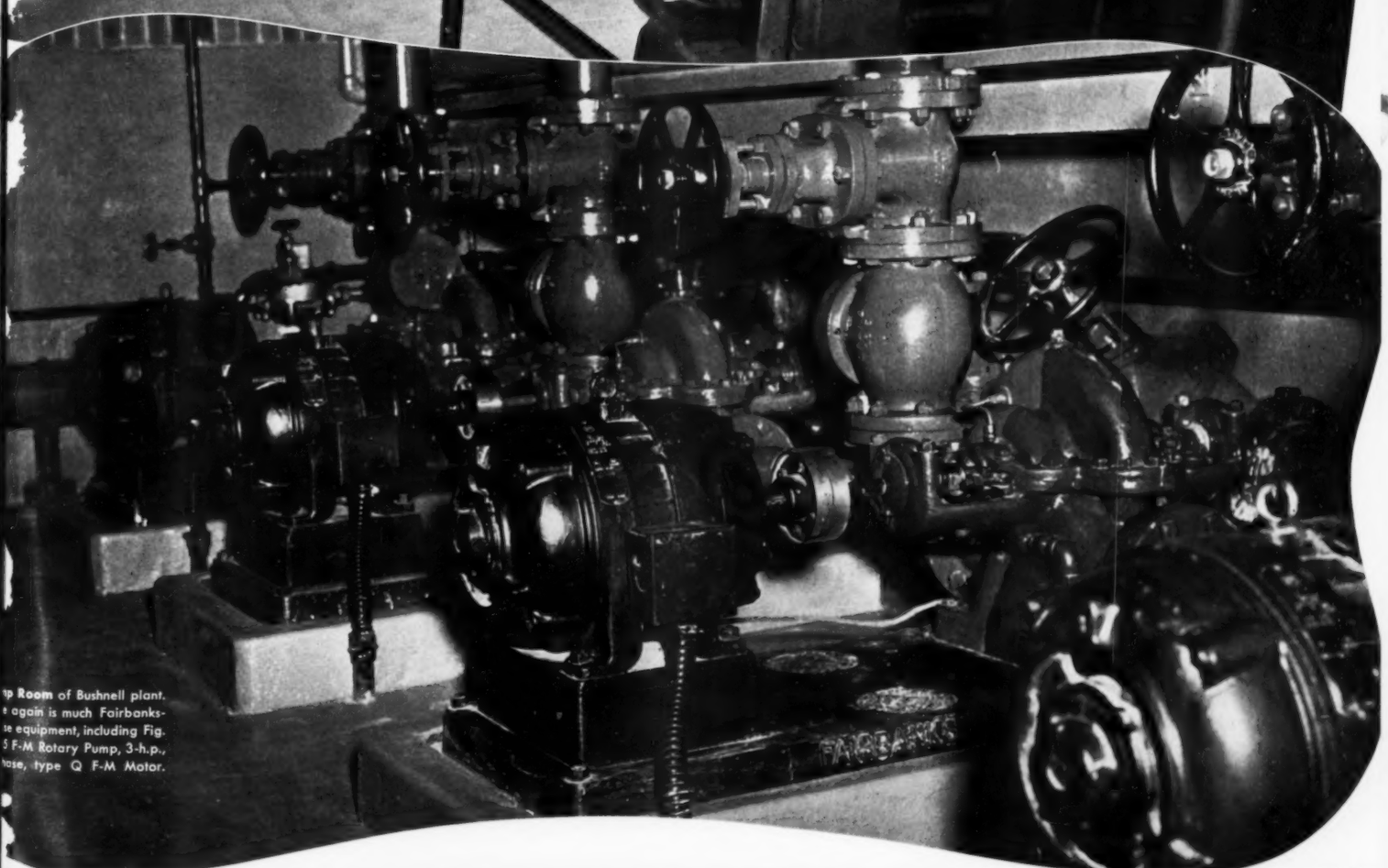
Hundreds of towns and cities throughout the United States are enjoying lower power and light rates, free street lighting, freedom from corporate taxation, and many other civic benefits as a result of operating their own light plants with Fairbanks-Morse Diesels. Bushnell is not an exceptional case. Your town could do as well. Why not find out *how well?* Write Fairbanks, Morse & Co., Dept. 23, 600 S. Michigan Ave., Chicago, Ill. Branches and service stations throughout the United States and Canada.

FAIRBANKS MORSE

DIESEL ENGINES ELECTRICAL MACHINERY RAILROAD EQUIPMENT WASHERS-IRONERS STOKERS
PUMPS FAIRBANKS SCALES WATER SYSTEMS FARM EQUIPMENT AIR CONDITIONERS



Bushnell Generating Equipment includes three 300-h.p. Model 32 Fairbanks-Morse Diesels direct connected to 225 KVA, 60-cycle, 2400-volt alternators, also of Fairbanks-Morse manufacture. Here again a slow-speed, 2-cycle heavy-duty Diesel has been wisely installed on a heavy-duty job for minimum upkeep and operating cost.



p Room of Bushnell plant. e again is much Fairbanks- se equipment, including Fig. 5 F-M Rotary Pump, 3-h.p., ase, type Q F-M Motor.

Diesels

The new General Electric Diesel-electric switching locomotive.

NEW DIESEL-ELECTRIC LOCOMOTIVE

By GEORGE D. CROSSLEY

THE march of Diesel motive power into railway service proceeds at an ever-increasing tempo as more and more railroads replace steam equipment with more economical and more versatile Diesel locomotives and as new designs make their appearance in the already impressive list of available types.

Now General Electric has announced a new 44 ton, 380 hp. Diesel-electric switcher and branch line locomotive featuring low operating and maintenance costs, one man operation in many situations and a high degree of versatility. Tractive effort at starting and low speeds is greater than that of a steam locomotive carrying equivalent weight on the drivers. This makes for greater flexibility and economy.

This new locomotive is equipped with two 190 hp. at 1000 rpm. Caterpillar, V type, 4 cycle, 8 cylinder, heavy duty Diesel engines, direct connected to railway type generators. Each of the four axles is driven by a high-speed, high-capacity motor especially designed for railroad service. Overall performance ability of this locomotive taken from its performance curve shows that at 35 mph. it can haul 224 tons on the level and 67 tons up a 1% grade. At 5 mph. it can haul 2040 tons on the level, 607 tons on a 1% grade and 357 tons on a 2% grade, including the weight of the locomotive.

Engine cooling is effected by radiators which are fitted with manually-controlled shutters. A Maxim M.U. exhaust silencer is supplied for each engine. Other attached engine accessories include Donaldson intake air filters, Michiana full flow lube oil filters, air cooled lube oil coolers, fuel oil filters and water circulating pumps. Two fuel oil tanks providing a 36 hour supply are fitted with Rochester Manufacturing Company Duplex gauges of the magnetic type.

This complete and modern locomotive can be operated on switching service at $1.50 per hour as compared with $3.28 for a comparable steam switcher. In road service the Diesel-electric locomotive can be operated at $2.18 per hour as compared with $5.03 for steam operation. Immediate acceptance of this new locomotive is indicated by the fact that seven railroads have already placed orders for a dozen of them.

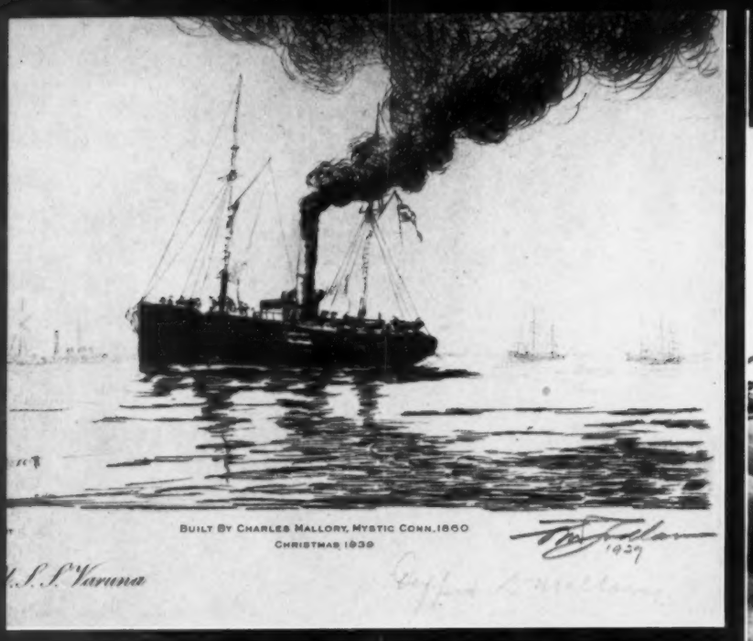
ANOTHER BONNIE DUNDEE

New Luders Yacht With Ketch Rig Employs Diesels For Auxiliary Power.

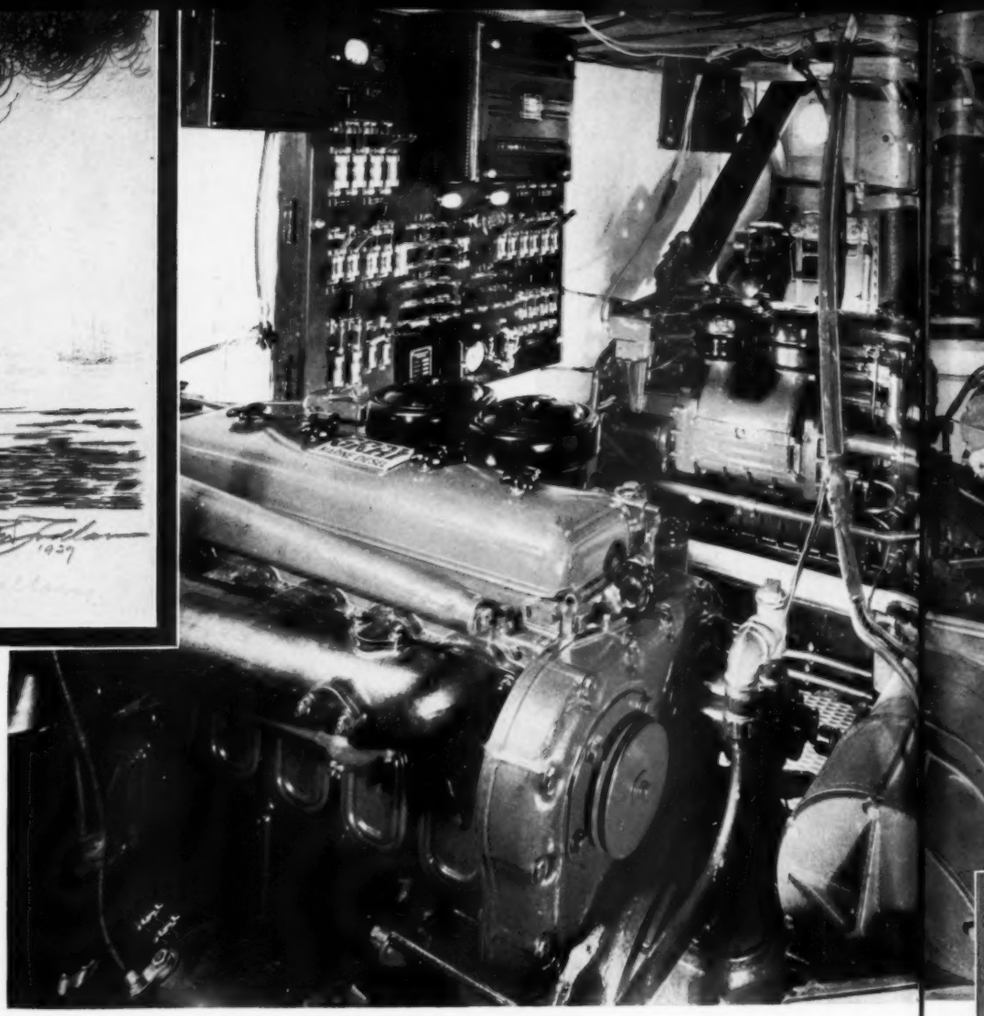
Commodore Mallory appears thoroughly pleased with the finger-tip control afforded by the Bendix-Holmes automatic steering and Allen throttle mechanisms.

On trials the new "Bonnie Dundee" made 9 knots close hauled under sail alone and 11 knots with engine only at 1500 rpm.

Bonnie Dundee is as well known to yachtsmen as the name of Mallory is recognized and respected in commercial shipping circles. The delivery of a new auxiliary cruising yacht to Commodore Clifford D. Mallory is, therefore, of particular interest to everyone who sails salt water, whether for pleasure or profit. In fact, to quote Mr. Mallory, "One of the principal reasons for building a new *Bonnie Dundee* was to secure first-hand information regarding service characteristics of two-cycle Diesel engines." As usual, this owner has incorporated many distinctive features in design and construction resulting from his personal knowledge and experience as one of America's most prominent yacht racing and cruising enthusiasts. As President of C. D. Mallory & Company, Inc., he represents the fourth generation of a distinguished family that has contributed consistently to this country's merchant



The U.S.S. "Varuna", shown in drypoint, was one of many ships built by Charles Mallory at Mystic, Connecticut, and was launched in 1860. She was later commissioned by the government during the Civil War and distinguished herself as a unit of Farragut's Western Gulf Blockading Squadron.



Athwartship view of the engine room shows the compact, twin Diesel drive, with lighting and starting batteries.

marine since 1816, and the fact that his personal interest in Diesels dates back to the first engine ever shipped to the United States by Dr. Diesel lends even greater interest to his recent decisions in favor of this type of power.

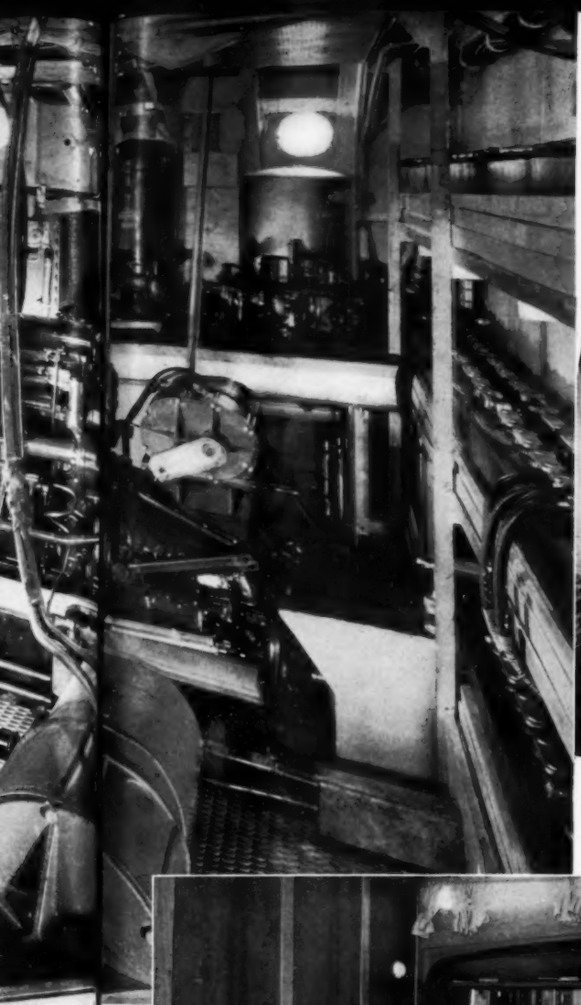
Although of similar ketch rig, with the mizzen mast stepped on deck, the new *Bonnie Dundee* is somewhat larger than her predecessor, measuring 85′ over-all with an 18′ 9″ beam and an unusually shallow draft of 5′ 6″ for cruising off Florida and the Bahamas.

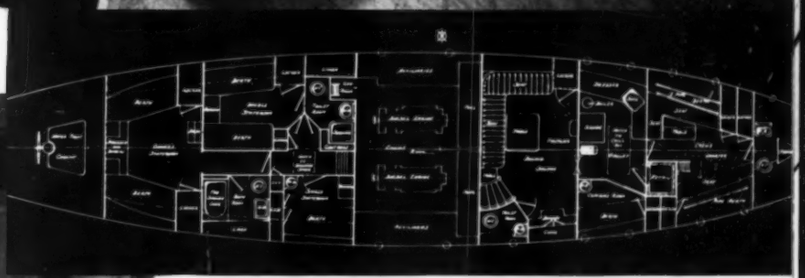
Composite construction was executed by Luders, and the quality of workmanship of this well-known yard merited a Lloyds rating of 100 A1 for the boat, despite the fact that such a classification was not anticipated until she was nearly two-thirds completed. The keel is of oak with teak stem and sternpost. Below the keel is a 32′ cast steel ballast keel weighing 15,000 pounds which also affords great protection in case of grounding. All frames, beams, stringers and other strength members are of welded steel, as are the six transverse bulkheads. Thoroughly seaworthy in every respect, the hull has easy lines with rather moderate overhangs and generally improved sailing characteristics.

Auxiliary power is furnished by a pair of two cycle, 165 hp. Diesels of the type developed by General Motors and adapted for marine service by Gray. They are fully described in Volume V of the DIESEL ENGINE CATALOG. Each engine drives a 46″ x 42″ solid bronze propeller through a Twin Disc clutch and reduction gear with a 4:1 ratio. The electrical system is of particular interest and represents several original ideas of the owner. There are no generators on the engines, as is customary in an installation of this size, and both starting and lighting circuits operate on 110 volts. Current is supplied by one main generator driven by V-belts from the tail shafts of both engines and fed to Exide batteries floating on the line. Since these batteries can furnish all requirements for a week without recharging and are maintained at full charge continuously while the boat is under power, it is not anticipated that the Stover auxiliary generating set will be needed under normal conditions, even in port. The simplicity and convenience of such an arrangement are at once apparent to all cruising yachtsmen. Total fuel capacity is 1500 gallons to provide ample range for extended offshore trips, and a maximum speed with engines alone at 1500 rpm. of 11 knots assures pleasant sailing regardless of wind conditions. Under sail alone, a speed of nine knots was attained close hauled.

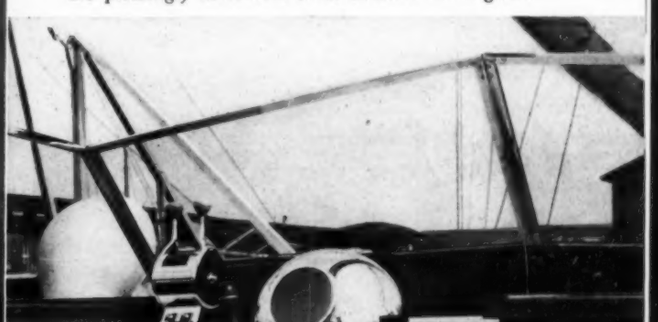
Accommodations are well arranged for convenience and comfort and are tastefully appointed, as the illustrations show. There are two double and one single staterooms for owner and guests and two baths, one tub and one shower. A ship-to-shore telephone, Bendix-Holmes automatic steering, Allen throttle and clutch control are representative of the numerous mechanical refinements that contribute to the pleasure of all on board and ease of handling for owner or guest.

As many readers of DIESEL PROGRESS know, this is the fourth *Bonnie Dundee* and the third to be powered with Diesel engines. There is not a single drop of gasoline carried, so that the chief fire hazard has been completely eliminated. There are Diesel ships, also, in the present fleet of C. D. Mallory & Company and mention has been made previously of the owner's active interest in this modern and economical type of power from its inception as a commercial unit in this country. His selection, therefore, on the basis of personal experience with Diesels both for pleasure and in business was made advisedly. In addition, Commodore





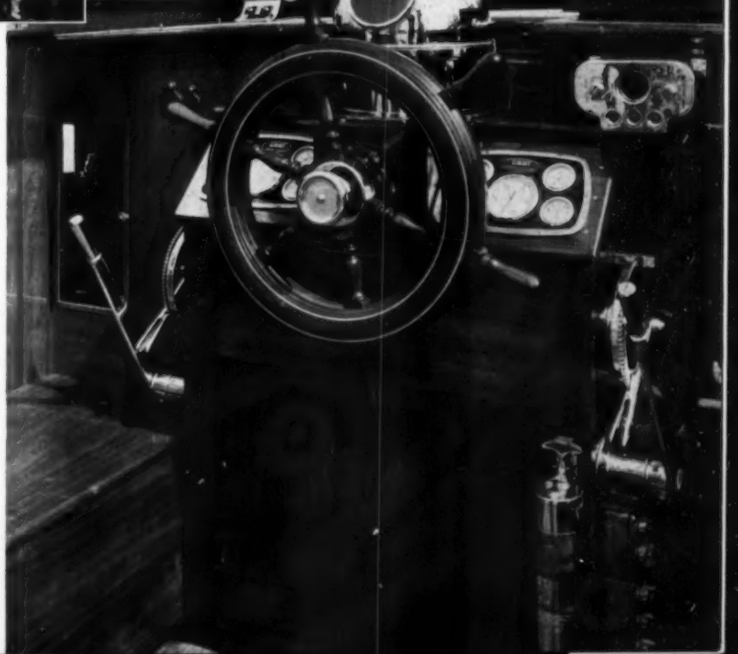
Top: The owner's stateroom where comfort and convenience are pleasingly combined. Note location in diagram.



Mallory served as the assistant to the Director of Operations of the United States Shipping Board during the last war, at which time he had ample opportunity to observe the characteristics of over 2000 vessels of various types and power. As a practical and highly successful ship operator with the sea in his blood for generations, his enthusiasm for marine Diesels points the way to safer, less expensive and generally more satisfactory yacht propulsion, whether main or auxiliary.

The dining saloon also extends from port to starboard and a curved stair leads from it to the spacious deck house above. The fireplace is typical of the detailed planning for comfort at sea.

All controls are efficiently grouped on the bridge within convenient reach of the helmsman. Bendix-Holmes automatic steering and Allen remote throttle controls assure positive and immediate response under all conditions.



THE SHEPPARD DIESEL

By WILBUR W. YOUNG

CULMINATING five years of original design and experiment, the R. H. Sheppard Company made its initial announcement of a complete Diesel engine package in the October issue of DIESEL PROGRESS. The first model offered for sale is a 3 cylinder, 4" bore, 5" stroke, 4 cycle full Diesel rated 25 hp. at 1200 rpm. for continuous full load with a fuel consumption rating, under these conditions, not to exceed .50 lb. per bhp. hour, with complete cooling equipment installed and fully loaded. While the power package will be supplied with all accessory units down to the last detail, interest is centered on some of the design features of the engine itself. Prominent among the features is the pre-combustion chamber. This is not an air cell, but rather a pre-combustion or turbulence chamber in that the fuel is injected directly into it and passes through it during expansion into the cylinder. This chamber is spherical in shape, the lower two thirds of which is formed of heat resisting steel, the upper one third being formed in the cylinder head. Connecting the chamber to the cylinder are three passages of different diameters and divergent angles.

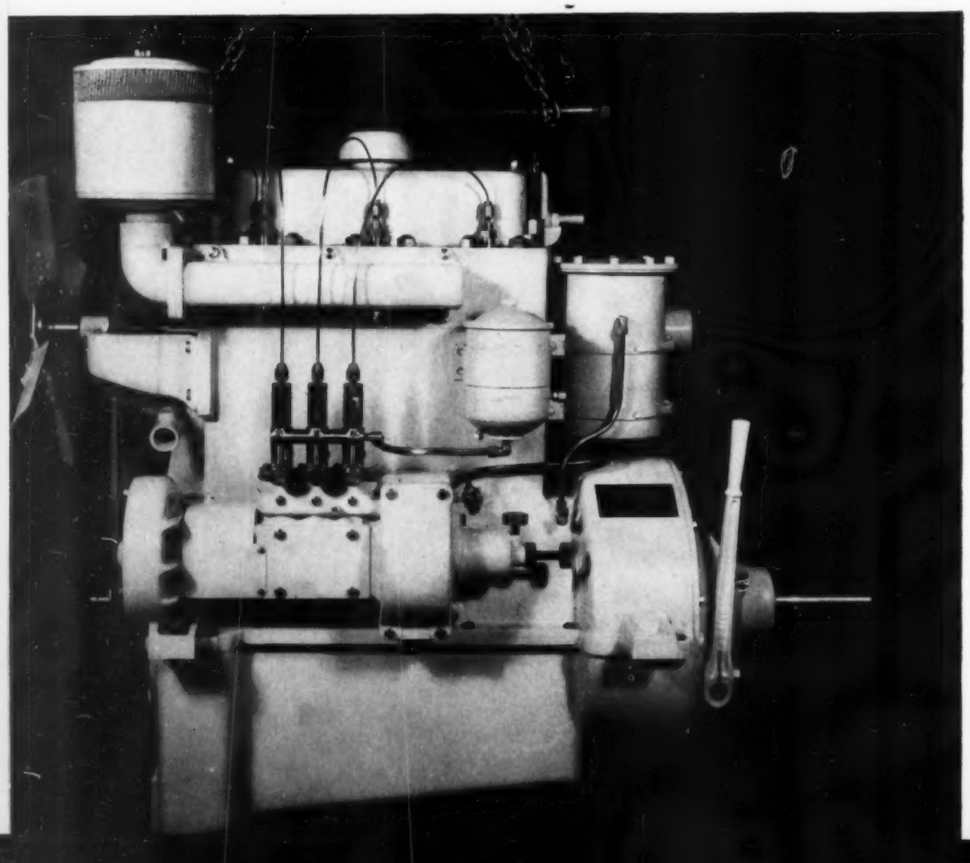
In action the fuel is insulated from the wall of the chamber by a layer of high velocity air entering from the three passages. Thus, an optimum of turbulence is created resulting in thorough and rapid burning of the fuel with resultant high efficiency, absence of detonation, easy starting at low temperatures, and freedom from smoke. Instead of achieving an even distribution of fuel with air, this design deliberately sets up a condition wherein the mixture is richest in the center of the mixture mass in order to prevent impingement of solid fuel against the enclosing surfaces where it would smolder and carbonize.

The arrangement of the passages from the pre-combustion chamber to the cylinder is such that the flame does not impinge directly on either the side of the piston or the cylinder walls, which would set up localized high temperature. Rather, the flame impinges directly on the piston crown sweeping across the cylinder bore. The piston crown is cooled from the underside by an oil spray directly beneath the point of impingement.

The fuel injection pump is of Sheppard design and manufacture, and is of the variable stroke type. This is accomplished by using a camshaft by which the cams can be retracted or protruded to increase or decrease the stroke according to the amount of fuel required, i.e. full-load more stroke, part-load part stroke. Both fuel pump cams and the fuel pump cam riders are ground on their profiles so that there is practically a constant velocity rise of the fuel pump plunger at full load and an almost instantaneous cut off. This effectively prevents dribble. The fuel pump camshaft is a shaft within a shaft. The center shaft is longitudinally movable to retract or protrude the cams either automatically by the governor, or by manual adjustment. The governor is mounted directly on the end of the fuel pump camshaft and the single governor spring is external in relation to the governor and although it is enclosed by a case, is readily accessible by removing only two screws. It is adjustable at all times from the outside of the fuel pump. Both the fuel pump and governor are lubricated from the crankcase and require no further attention. The fuel pump plungers, cam riders, and cams are all made of hardened steel and are ground to tremendously close tolerances; for example, the plungers have a total tolerance of .0001 of an inch for taper, roundness, and dimension. The cams and cam riders have a minimum hardness of 64 Rockwell C Scale. A feature of the pump is that to prime it, it is only necessary to loosen one little hollow head set screw on each of the pump cylinders and to turn the engine over a few times with the starter. It is not necessary to disassemble the pump, injectors or injector tubes to prime them, even when there is no oil whatsoever in the system. The pump contains two hardened and ground steel valves with hardened and ground valve seats on the discharge side of the pump. The inlet side of the pump is ported and requires no valves.

The injectors are the product of several years'

Injection side of the Sheppard Model 6, three cylinder Diesel.

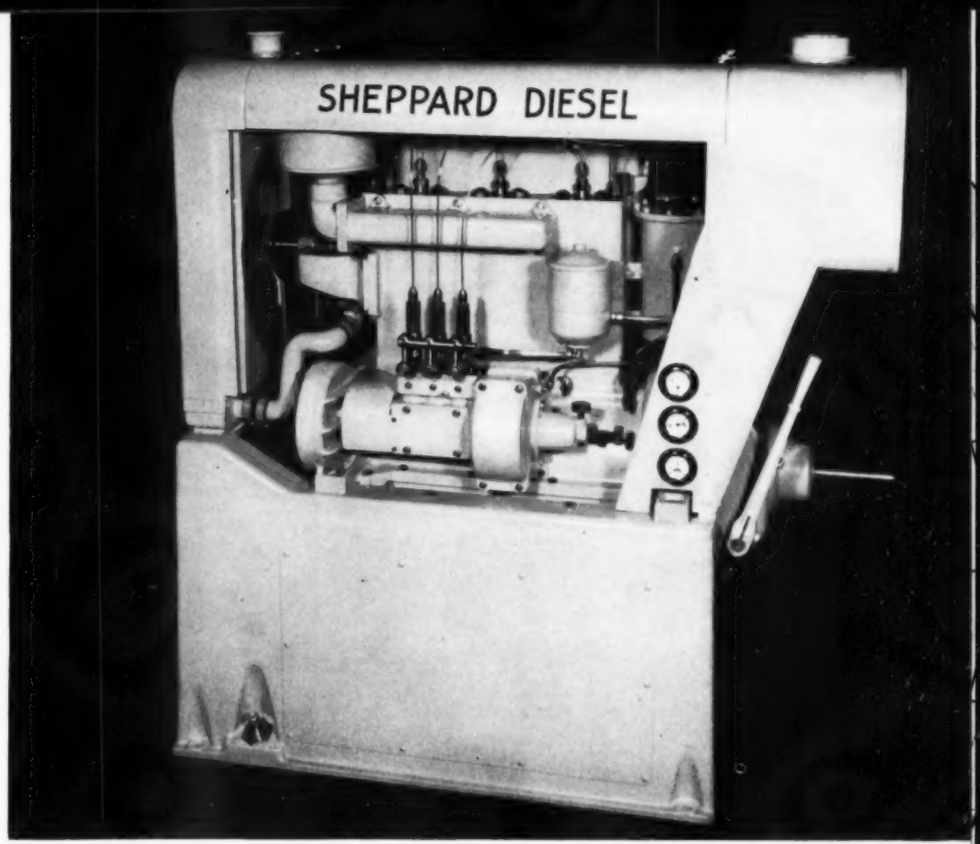


exhaustive research. They use one single orifice, .046 in diameter. This is so large as to prevent any possibility of clogging. They are not pintle type, nor do they contain any ball valves, but they do contain a small spring loaded check valve, which is hardened and ground as is its seat. The injector is self-bleeding and will not capture and hold an air bubble anywhere in the structure to cause pre-ignition. They may be operated in any position. To renew the valve it is only necessary to unscrew the tip, remove the old valve and seat and drop another one into place.

The piston pins are ground to a total tolerance of .0002 of an inch and are held to .0001 for roundness and taper. They are made of alloy steel and their hardness is 60 Rockwell C Scale. The replaceable liners are of special hardened iron of Sheppard design cast by Frank Foundries and have a hardness of 48 C Scale. The crankshafts and camshafts are completely machined in the Sheppard plant and both are hardened. The crankshaft, forged by Atlas Drop Forge Company, carries a tolerance of .0005″ and is fully counterweighted. The camshafts are held to a tolerance on the journals of .0005″ and have a minimum hardness of 64 Rockwell C Scale. The Sheppard designed pistons are fitted with Perfect Circle rings. Federal Mogul cadmium silver steel backed replaceable shells are used on main and connecting rod bearings.

The complete power unit includes all equipment necessary for full operation wherever fuel is available. Aside from the internal features already discussed, the engine is fitted with a Twin Disc power take-off and clutch, Modine radiator, and Service Products fan and a Fulton-Sylphon thermostat to protect the cooling system. Fram filters are supplied for both fuel and lube oil. A feature of the fuel filter provides for automatic stopping of the engine when the filter element requires changing. Electric Auto-Lite starting motor, generator and generator regulator with overcharge cutout together with a 12 V Bowers storage battery make up a complete electrical starting system. And finally an instrument panel with U. S. Gauge oil pressure, and water temperature gauges and an ammeter.

R. H. Sheppard, designer of this versatile engine has worked through the last five years with the potential users, who are legion, uppermost in his mind. The keynotes of his design are ruggedness, simplicity, ease and low cost of replacing parts and assemblies and above all a complete power package that can be virtually delivered running. The unit is so planned that it becomes immediately available for generator, pump, compressor drive and for general private or industrial use as well as for use in automotive applications.



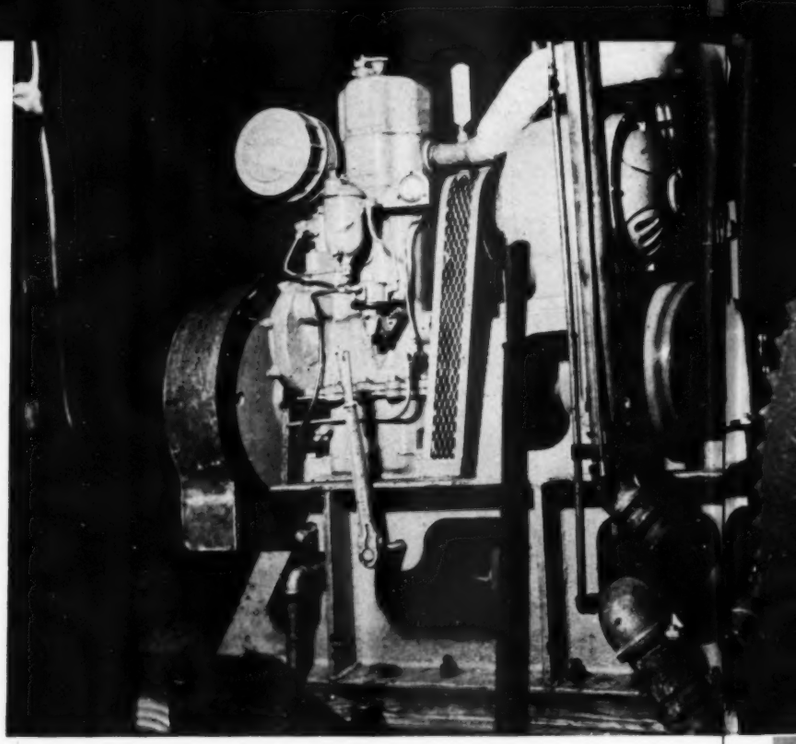
Injection side of the Sheppard Model 6, power package.

We understand that the Model 6, described above, is the forerunner of several other models to be announced soon but which will embody the same basic design and complete accessory equipment.

Exhaust side of power package unit. Note complete accessories.

"ANNA SOPHIA" DIESEL SCHOONER

By DWIGHT ROBISON



The Reiner auxiliary unit consisting of Diesel engine, compressor, generator, and service pump.

AFTER many years of service as a sailing vessel in the granite trade between Maine and New York, the *Anna Sophia,* now completely overhauled and equipped for Diesel auxiliary drive, stands ready for South American and Caribbean trade. Since she was especially constructed for carrying granite, the hull is unusually strong for a wooden vessel, being framed with 12″ timbers spaced 15″ and planked with 4″ yellow pine and sheathed in the cargo hold with 5″ yellow pine. She measures 102′ long, 30.6′ wide, and 8.5′ deep. Thus, the general sturdiness and arrangement renders the *Anna Sophia* adaptable for auxiliary drive as well as satisfying the American Bureau and insurance requirements for the service contemplated by her present owners.

When. Messrs. E. C. Cohrone and R. C. Seemann, now known as the C & S Navigation Company, were with the Lago Petroleum Company at Maracaibo, Venezuela, as Superintendent of the Shipyard and Foreman of Diesel Maintenance respectively, they realized the possibilities of a trading venture between New York and South American ports. In this former connection, these gentlemen had charge of 135 Diesel tugs with an aggregate of 10,000 horsepower. It is only natural that they should select Diesels for the *Anna Sophia* as they approached the realization of their long-standing plans.

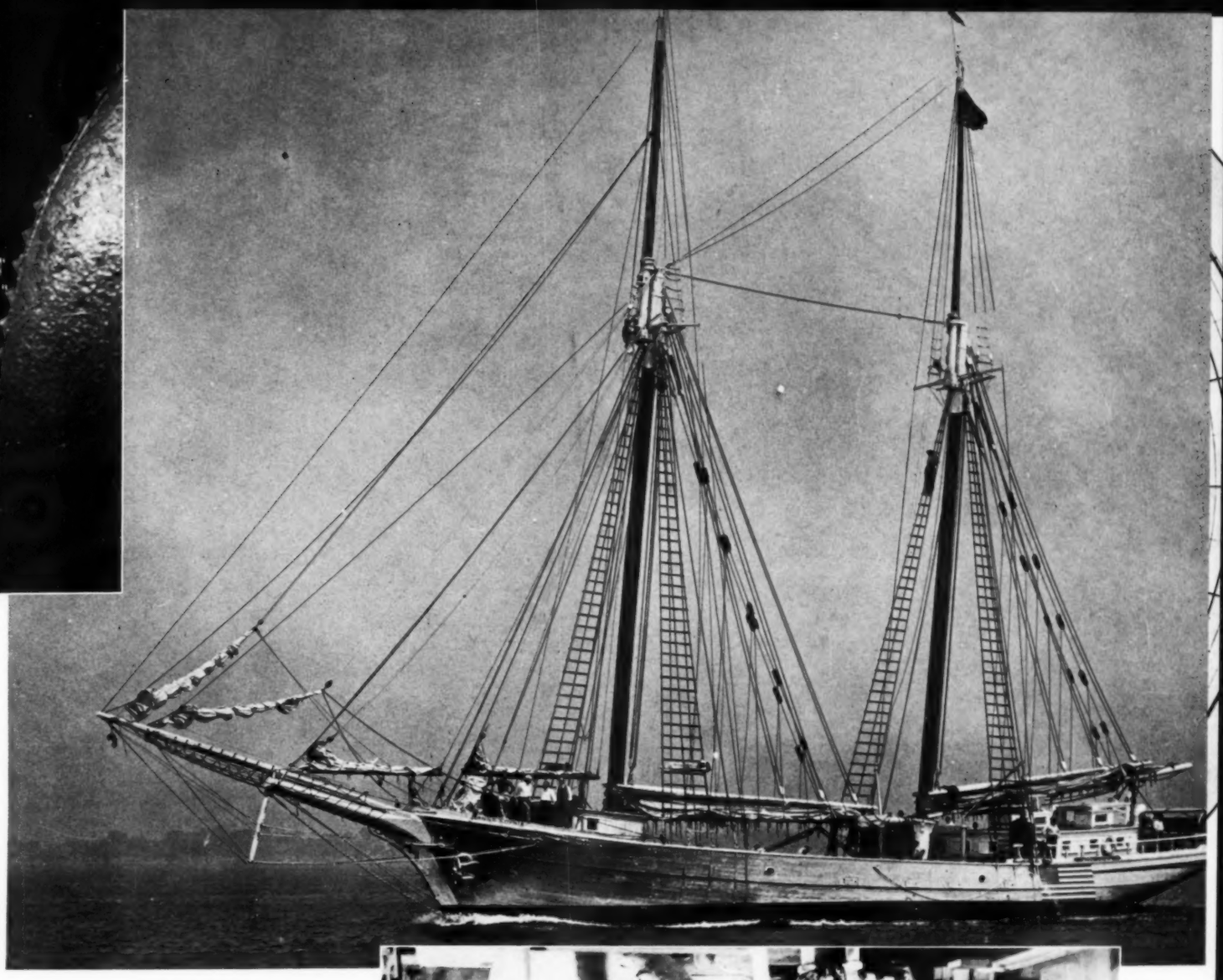
The whole problem of converting this sailing vessel was placed in the hands of the Marine Basin Company where a happy combination of equipment and experience exists. Without plans or drawings, the job was done in exemplary workmanlike fashion against the handicaps to be expected in adapting a sailer for power propulsion. In drydock, the stern tubes were installed with spring loaded stuffing boxes and arrangement for keeping the tubes charged with oil under pressure. Before putting her back in the water, copper sheathing was installed below the water line.

The twin Superior Diesels were installed in an engine room formed in the after section of the hold by placing a steel bulkhead forward of the mainmast. The engines are each 6 cylinder, 4 cycle, rated 135 hp. at 700 rpm. driving through Twin Disc clutches with 3:1 reduction gears incorporated. The latter units are used as sailing clutches. The engines are fitted with Nugent pressure filters for lube oil conditioning and Purolator fuel oil filters. An Alnor pyrometer on each engine provides for the essential check-up of individual cylinder exhaust temperature and Reliance tachometers show engine speeds. A closed, fresh water engine jacket cooling system is provided.

Electrical requirements consisting mainly of lighting and electric refrigerator are supplied from a 5 kw. Electro Dynamic shaft generator belted to the port engine with a National Lead battery floating on the line. The Reiner auxiliary unit consists of a single cylinder, 5 hp. Stover Diesel clutched to a 2 kw. generator, Quincy compressor, and a service pump.

Fuel, air, and water tanks are ingeniously arranged in the limited space aft of the engine room. Fuel capacity of 4500 gal. provides for a cruising radius of 3,000 miles without benefit of sails.

Another 5 hp. Stover Diesel is installed above decks forward which, through a clever arrangement of clutches and gears, referred to around

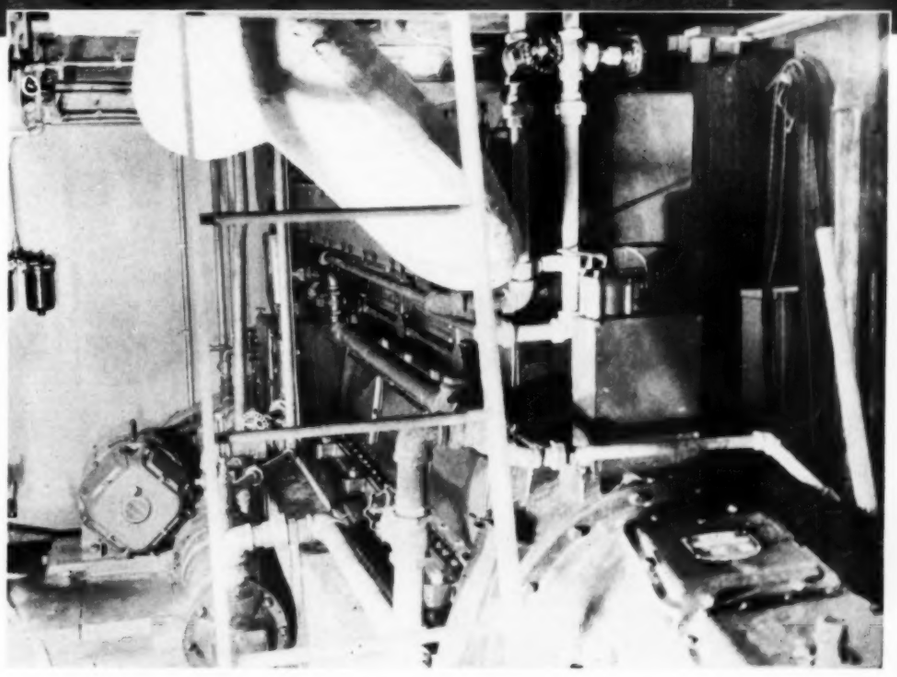


The "Anna Sophia" on successful trials after conversion.

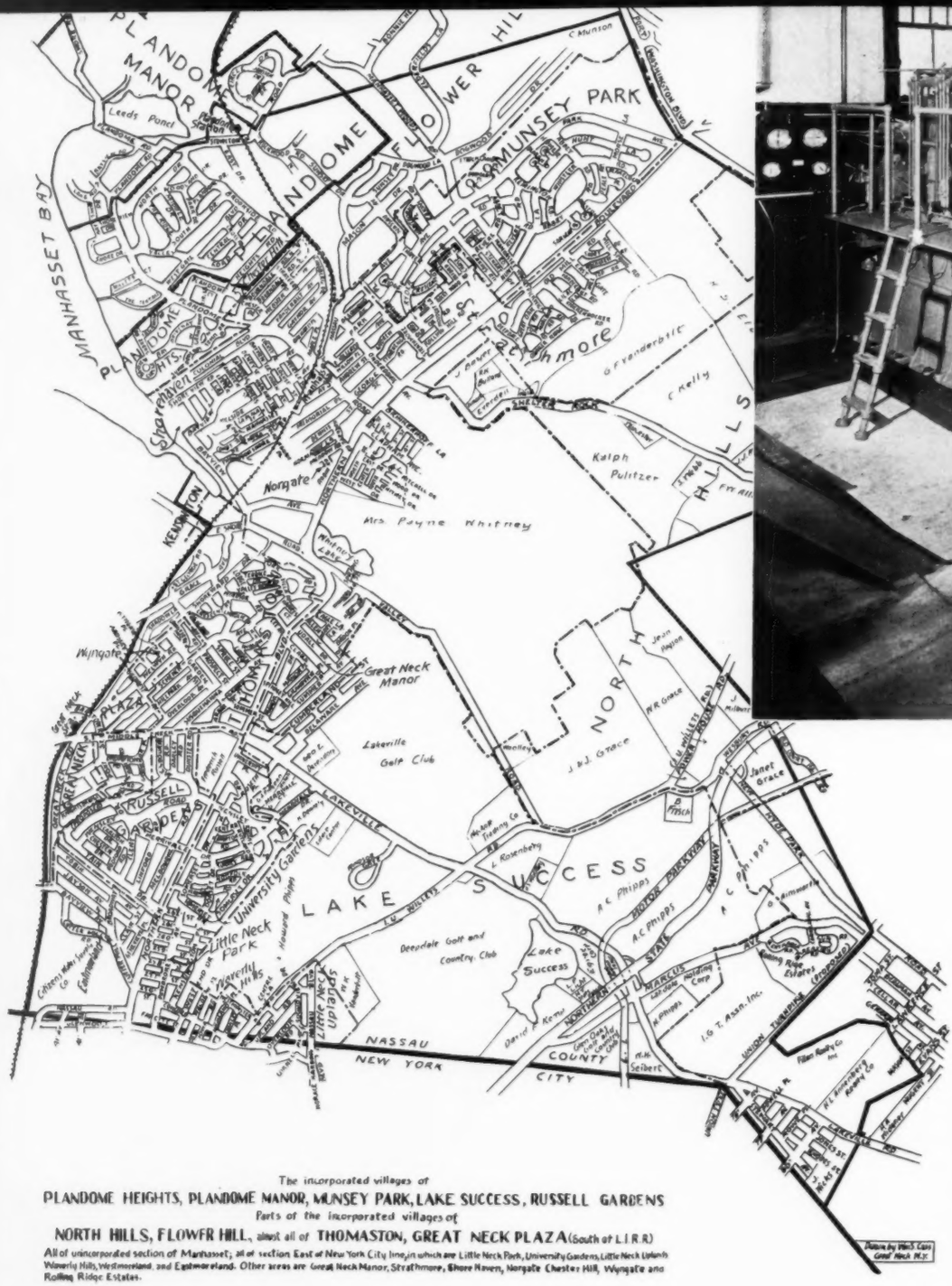
the Marine Basin yard as the "Rube Goldberg", drives both the anchor windlass and sail hoist.

Crew's quarters include provision for six forward and two officers in the deck house aft. Considerable care was exercised in the selection of galley equipment since the *Anna Sophia* will spend much time in the tropics.

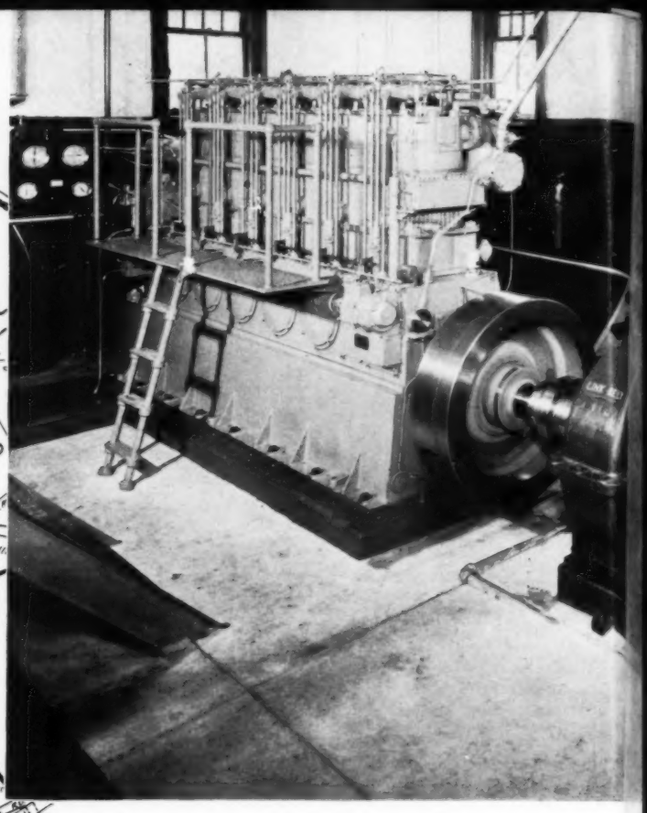
Having stood up well to her trials under observation of her owners, the Marine Basin force, and National Supply engineers, she is ready for a trading venture that smacks of almost forgotten days. This sturdy hull bids fair to exemplify the transition from sailing vessel to modern Diesel propulsion while perpetuating the waning art of sailing for years to come.



One of the twin propulsion Diesels. Note Twin Disc clutch lower right.



The incorporated villages of
PLANDOME HEIGHTS, PLANDOME MANOR, MUNSEY PARK, LAKE SUCCESS, RUSSELL GARDENS
Parts of the incorporated villages of
NORTH HILLS, FLOWER HILL, almost all of THOMASTON, GREAT NECK PLAZA (South of L.I.R.R.)
All of unincorporated section of Manhasset; all of section East of New York City line, in which are Little Neck Park, University Gardens, Little Neck Uplands Waverly Hills, Westmoreland, and Eastmoreland. Other areas are Great Neck Manor, Strathmore, Shore Haven, Norgate Chester Hill, Wyngate and Rolling Ridge Estates.

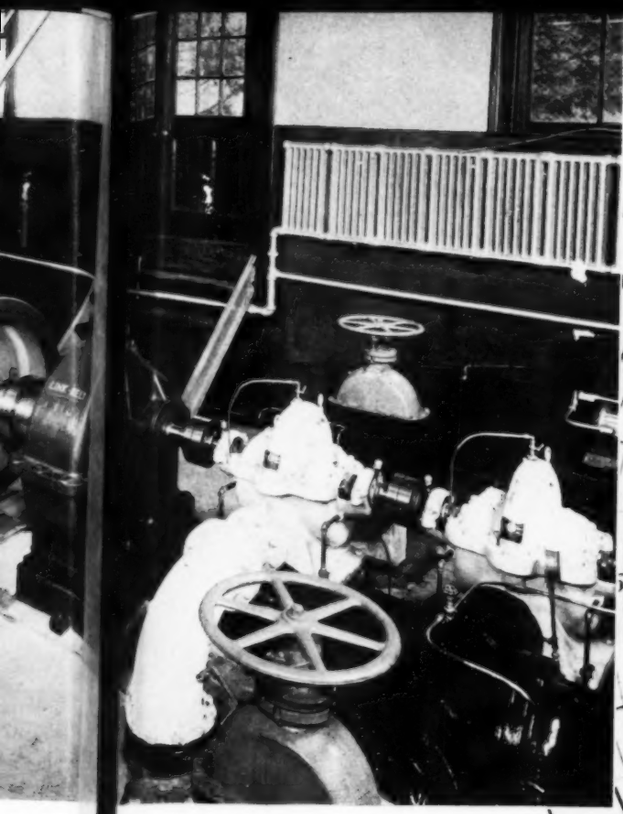


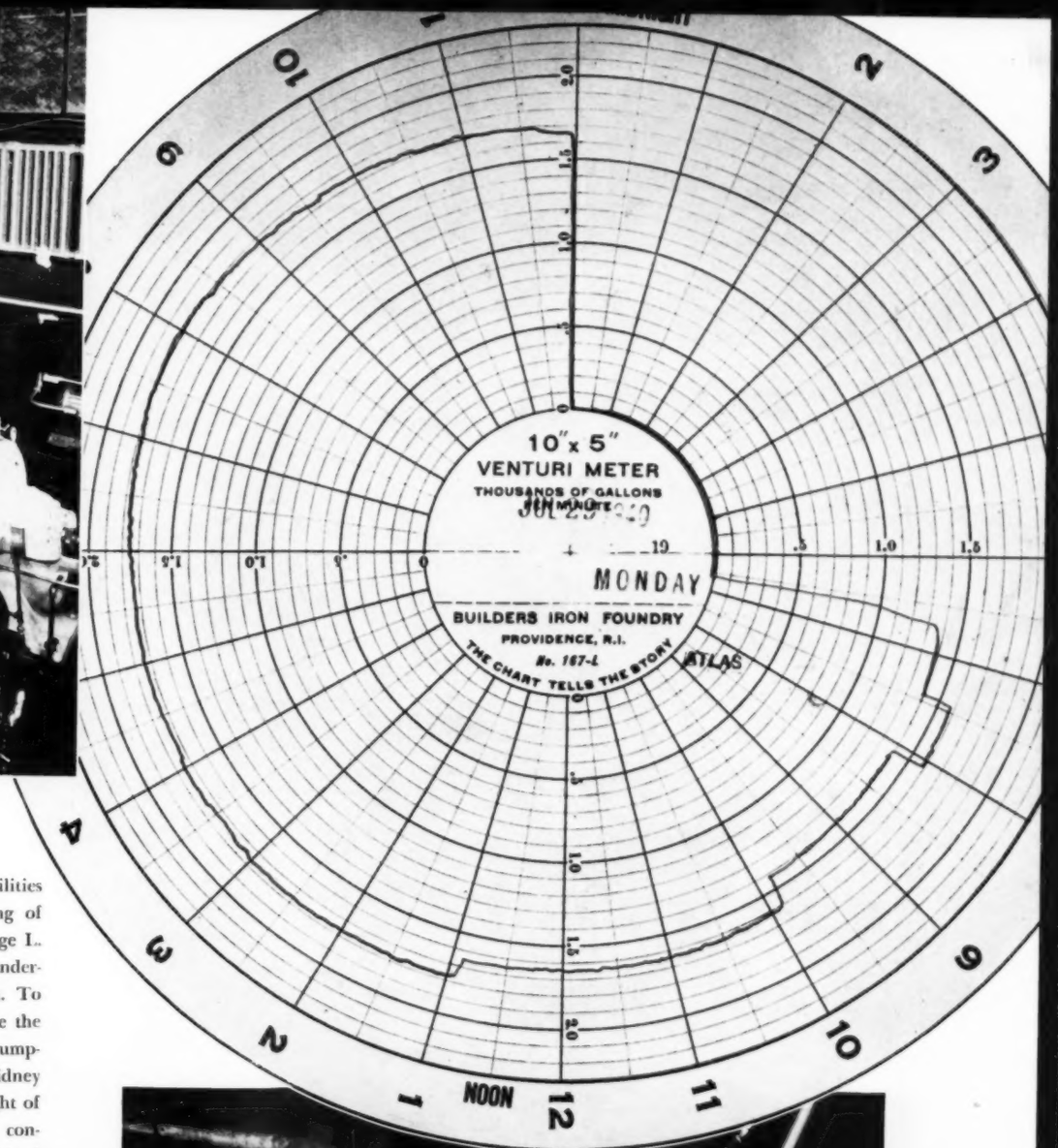
MANHASSET-LAKEVILLE WATER DISTRICT

Diesel Pumping Unit Reduces Power Costs 75%.

WHEN Water Works Commissioners can increase the capacity of a pumping station and, at the same time, reduce pumping power costs by almost three-quarters, it is good news for tax payers in their district and important news for citizens of other communities. This is exactly what happened in the Manhasset-Lakeville Water District of Long Island, New York, and carefully kept records are available to prove such economies, as well as greater dependability of supply to the mains for an extra dividend. Fortunately, the answer to this paradox is neither complicated nor expensive, and a full explanation with authentic operating figures should be of interest to all who appreciate the value of a more reliable public water works with substantially less power expense.

Prior to the spring of 1940, this station operated with one motor-driven deep well pumping unit rated at 1100 gpm., with a fourteen year old, 110 hp. Diesel-driven reciprocating pump which is now used for stand-by service and light load periods. The large deep well pump is powered with a 200 hp. motor, and electric current was purchased from the local utility. Steadily increasing water consumption of the growing communities served by the station

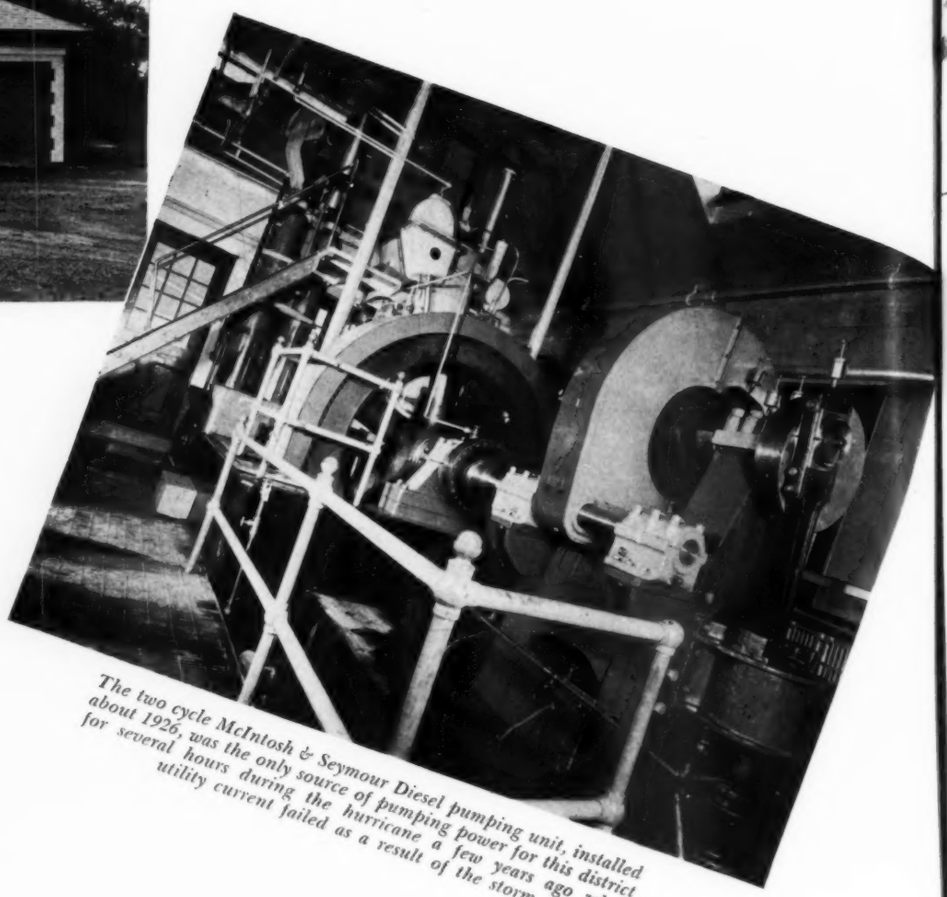




necessitated expansion of pumping facilities this year, and the Commission, consisting of Mr. Kenelmn Eden, Chairman, Mr. George L. Gehrig, and Mr. Clarence G. Hamel, undertook an investigation of new equipment. To assist them in this survey and to supervise the planning and installation of additional pumping units, the Commission retained Mr. Sidney B. Bowne, Consulting Engineer. In the light of past experience it is not surprising that considerable attention was given to modern Diesel pumping units, since these are not subject to service interruptions during electrical storms, due to circuit breakers "kicking out", and provide an absolutely independent source of power under all conditions of emergency. This point was well emphasized to the members of the Commission during the hurricane several years ago. In fact, had it not been for the old Diesel unit at that time the entire station would have been paralyzed for six hours until utility power could be restored. The danger from fire under such conditions is obvious. As it was, no interruption of service occurred and water was supplied to the neighboring district by connecting adjacent fire hydrants with a length of hose. Thus, Diesels thoroughly satisfy the prime requisite of water works service, which is de-

Superintendent J. B. Reeves takes a tachometer reading from his new Atlas Imperial Diesel pumping engine. The engine and pump arrangement is clearly shown above. At the right appears a typical summer pumping chart.

The exterior of the Manhasset-Lakeville pumping station shows the pleasing architecture and landscaping of this plant. Offices in the wing at the right are conveniently located near the machinery floor in the main part of the building.



The two cycle McIntosh & Seymour Diesel pumping unit, installed about 1926, was the only source of pumping power for this district for several hours during the hurricane a few years ago when utility current failed as a result of the storm.

pendability. Operating records indicated substantial savings in power costs as well, so this type of unit was selected.

The new equipment consists of a six cylinder, heavy-duty type Atlas-Imperial Diesel, rated at 275 hp. at 300 rpm. and connected through a flexible coupling and Link-Belt speed-increasing gear to two single stage De Laval centrifugal pumps in series, delivering against a total head of 391 feet. These pumps have a capacity of 2000 gpm. each at 1800 rpm. Practically all engine auxiliaries are integrally mounted except the Alnor pyrometer, a starting air compressor and the Maxim exhaust silencer, located at the rear of the building. Thus, engine and pumps form a simple, compact unit that fits easily into space previously occupied by obsolete equipment. Jacket water is cooled by a Condenser Service & Engineering heat exchanger located in the discharge line from the pumps. To insure nothing but clean air entering the cylinders, two Vortox air cleaners are installed on the intake manifold of the engine. Fuel and lubricating oil lines are fitted with Purolator filters. For positive action and maximum simplicity of engine room layout all elements of the new pumping unit are shaft-driven, and even the vacuum pump is direct-connected to an extension of the second pump shaft. The engine cooling water circulating pump drives directly from an extension of the high-speed gear shaft on the side opposite from the first pump. The Turbine Equipment Company of New York City acted as general contractors and furnished and installed the Diesel, pumps, gears and auxiliary units. The unusually compact and efficient arrangement is well illustrated by the general view of the new equipment.

Performance of the new Diesel as a pumping engine is best judged from actual data, which are averaged from six trials made under the direction of Superintendent J. B. Reeves:

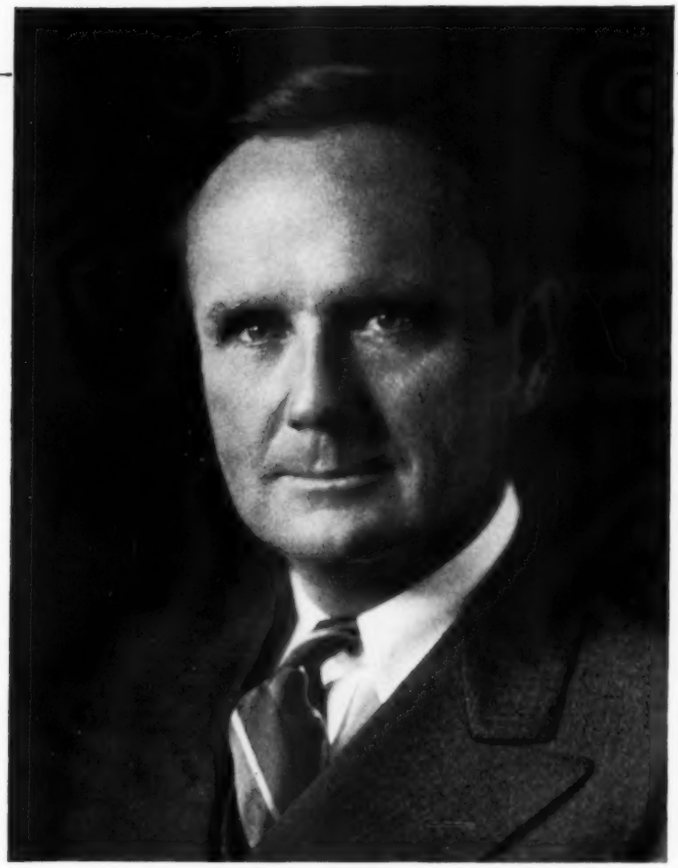
Suction lift	18.39′
Discharge head	161.50 lbs.
Total head	169.20 lbs.
Delivery	2038 gpm.
Engine load	248 bhp.
Engine speed	297 rpm.
Fuel consumption	0.394 lbs./bhp./hr.

Accordingly, it required 110 gallons of fuel to pump 1,000,000 gallons of water at a total cost for both fuel and lubricating oil of only $8.16 allowing for periodical changes in lubricating oil and including a maintenance sinking fund at the rate of $1.00 per horsepower per year. Compared with an electric power cost of $32.20 per million gallons in the same plant and under similar conditions, the saving effected by the Diesel amounts to 74.2 per cent or $24.04 per million gallons pumped. It should be noted that electric pumping costs are based on the unusually low average rate of 1.54 cents per kilowatt-hour. Since no additional personnel is required by the Diesel pumping unit, items of overhead can be considered constant and annual savings computed on the basis of power cost saving multiplied by millions of gallons pumped per year. Obviously, the Diesel will soon pay for itself, after which the substantial difference in pumping costs can be applied against further plant expansion and modernization or both, according to future needs.

The Manhasset-Lakeville Water District is shown by the accompanying map, which indicates that it is typical of many such districts throughout the United States. It covers approximately sixteen square miles presenting a variety of service problems. There are twenty-eight wells at the station, ranging in depth from 140 to 150 feet and one deep well of 428 feet. At the present time there are roughly four thousand regular consumers, and the steady growth that has characterized the communities served may be expected to continue. The recent action of the commissioners, therefore, in providing both economical and dependable pumping capacity against future as well as present needs may well provide a worth-while example to other communities. Rising costs of government and public services can best be met by increased efficiency, both in men and machines, which has been done in this case.

THE MEN BEHIND THE DIESELS YOU BUY

BYRON CLAUDE HEACOCK



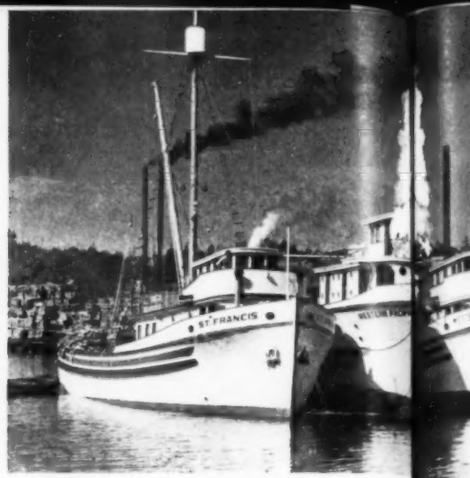
President, Caterpillar Tractor Company, Peoria, Ill. Chairman Board of Directors, Illinois Manufacturers' Association. Chairman of the Manufacture Committee, United States Chamber of Commerce and a member of the Executive Committee.

★ Born on August 20, 1889, B. C. Heacock is the son of Joseph B. and Emma L. Heacock, farmers in the vicinity of Emporia, Kansas. He was one of eight children of whom five are still living. When he was about ten the family moved to Manhattan, Kansas, where he completed grade school and one year of high school. At 14 he worked as a farm hand and truck gardener's helper near Manhattan. Then went to work as a clerk in the-town's retail stores. At 17 he went into the local bank as a junior clerk, salary $25.00 weekly. From the bank he went to Topeka, Kansas as a bookkeeper for the Topeka Building & Loan Association. He married Miss Nellie Coulter of Topeka in 1912. Then he roamed a little. To San Diego, Calif., back to Ann Arbor, Mich., then to Detroit, where he spent two years with Ernst & Ernst, Chartered Public Accountants, then back to San Leandro, Calif., where he became auditor for The C. L. Best Tractor Co. When the Best Company and the Holt Manufacturing Company of Stockton, Calif., joined to form the Caterpillar Tractor Company, in the early part of 1925, Mr. Heacock became "Caterpillar's" first Secretary. Later he became First Vice-President, and in June, 1930, when Mr. R. C. Force became Chairman of the Executive Committee, Mr. Heacock, at the age of 41 years, was elected President.

★ When principal manufacturing was transferred to the more centrally located Peoria, Illinois, factories, Mr. Heacock, his wife and daughter, Miss Helen Heacock, took residence there. The executive gives liberally of his time to the community's civic affairs, and has been honored with election to the Board of Trustees of Bradley Polytechnic Institute of Peoria. Mr. Heacock's activities, in forwarding Middle West industry and his popularity among executives nationally, have brought him considerable prominence. The former resulted in his service for two consecutive terms (1936-1937, 1937-1938) as President of the Illinois Manufacturers' Association. He is now chairman of the Board of Directors of that organization. He is chairman of the Manufacture Committee of the United States Chamber of Commerce and a member of the Board of Directors of that Chamber. Mr. Heacock also serves the Farm Equipment Institute, national educational organization of farm machinery manufacturers, as a member of the Executive Committee. Governor Henry Horner appointed Mr. Heacock a member of the Advisory Council, Illinois State Employment Service in June, 1935. Two years later, Governor Horner named him to the State Sanitary Water Board. He was a delegate from his congressional district to the 1940 Republican Convention.

FISHING VESSELS FROM TACOMA YARDS

By CHAS. F. A. MANN



THE builders of steel hulls may find their plans in a drafting room and in a fabricating shop, but the builders of husky wooden fishing vessels on Puget Sound keep all their plans in their heads.

There is no set formula for building a purse seiner, halibut schooner, or a troller. Like the art of commercial fisheries, the art of building fishing vessels seems plastic—never standing still—each year evolving some new time-saving wrinkle, changing the size and ever seeking refinements in motive power, with lower operating costs, simpler handling and longer operating range.

Fifty years ago the purse seiner was born in a Tacoma boatyard, and some twenty-five years ago the first Diesel engine ever used in a fishing vessel was tried out on a Puget Sound purse seiner.

Since that time the purse seiner type has become a world standard and the fishing fleet of not only Puget Sound but the whole Pacific Coast, with the exception of a few Columbia River gillnetters, some Alaska trollers, and a few North Coast halibut ships, is the most nearly 100% Dieselized marine fleet in the whole world. Over 7,000 Diesel-equipped fishing vessels now make up the mighty fleet of the Pacific Coast.

The annual turnout in six Tacoma shipyards, handily located near the source of supply of fine, hard fir and cedar timbers, exceeds $1,000,000 even in a poor year. It has reached $2,000,000. Over 1,000 fishing vessels have been built in Tacoma since 1890. Every type of equipment and Diesel engines, from 400 hp. down, have been tried out, and annually new wrinkles appear that are startling in their ingenuity.

Noted in the 1940 crop of Tacoma boats, which totalled thirty-four in number and cost over $1,400,000, were the following developments:

1. Continued increase in size of purse seiners—they're running close to 90 and 100 feet. Once they ran from 40 to 50 feet long.

2. Penetration of new types of Diesels, largely Midwest built. In 1940, the Mack-Lanova appeared on Puget Sound for the first time in a neat Alaska halibut boat, the *J. B.*, owned by John Bogen of Ketchikan, and built at the Peterson & Johnson shipyard, Tacoma. This vessel is 48 ft. long and has a 6 cylinder, 80 hp. Mack-Lanova Diesel, the first Lanova-type fishing vessel installation of record on Puget Sound.

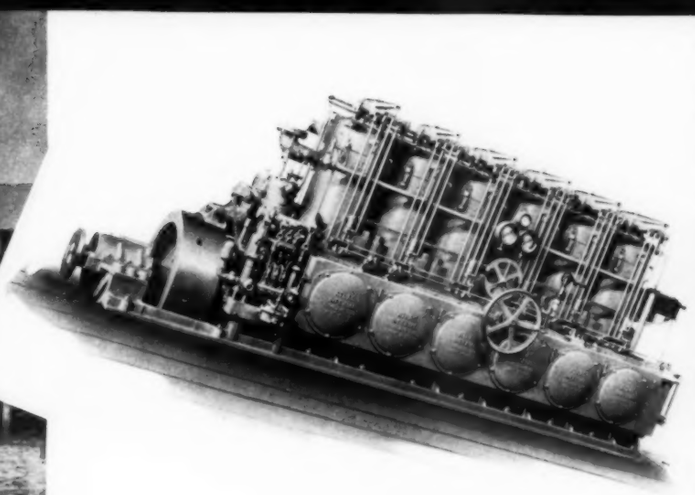
3. The *St. Francis*, giant purse seiner built by Western Boatbuilding Co. for Herbert Ursich of Gig Harbor, emerges as the first purse seiner to be built without a turntable. Elimination of the turntable at the rear keeps the entire after part of the deck free, changes the method of stacking the 2000 feet long, 160 feet deep seine nets, with lead weights on one side and cork floats on the other, and brings out a new method of purse seine fishing. The *Western Pacific* and *Western Queen*, also from the Western Boatbuilding yards, are shown above with a shop view of the 400 hp., 6 cylinder Atlas Diesel engine installed in the *Western Queen*.

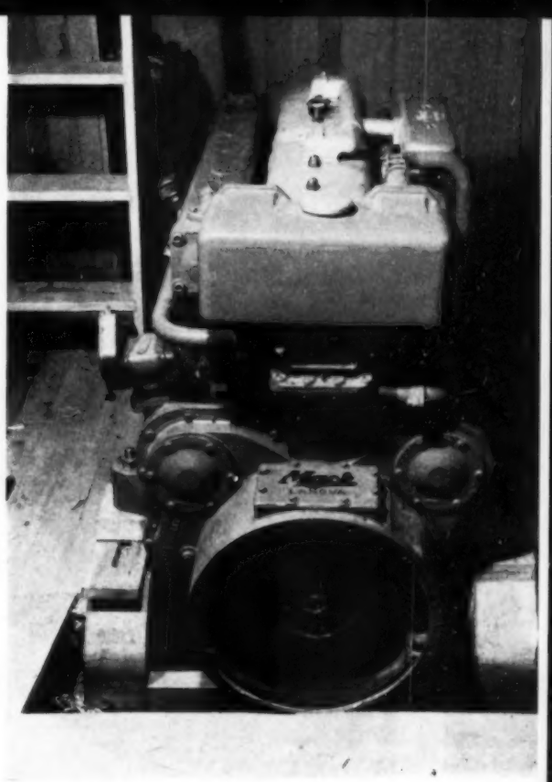
4. So important is the purse seiner becoming, that the Navy Department at Washington has bought a half dozen seiners for experimental study. This is important when you can build a husky 100 ft. seiner, complete and ready for the water in sixty working days at a cost of $50,000 and a Diesel cruising radius of 3,000 miles.

5. The Buda, Bolinders, Gray, Cummins, Caterpillar, pint-size Atlas, Enterprise, and Washington Diesels, and Superiors are gradually replacing gasoline motors in the trollers, gillnetters, halibut boats—the small fishing vessel types long addicted to gasoline. Chrysler sold a gasoline engine or two in this group during 1940, but that is about all. Some tinkering has been done with reduction geared gas engine drives, but they are too complicated.

6. Full two-way radiophone, direction finders, photo electric pilots, mechanical galley refrigeration, spring-filled mattresses, oil burning galley ranges, hot and cold running water, shower baths, Catholic Shrines (in small, beautifully carved Shrine Rooms—to bring fishermen better luck), increased use of non-corrosive shafting, dual and even triplex pilot house engine controls in two or three different locations—all these are becoming recognized standard items that are MUSTS on the beautiful purse seiner fleets and the bigger halibuters.

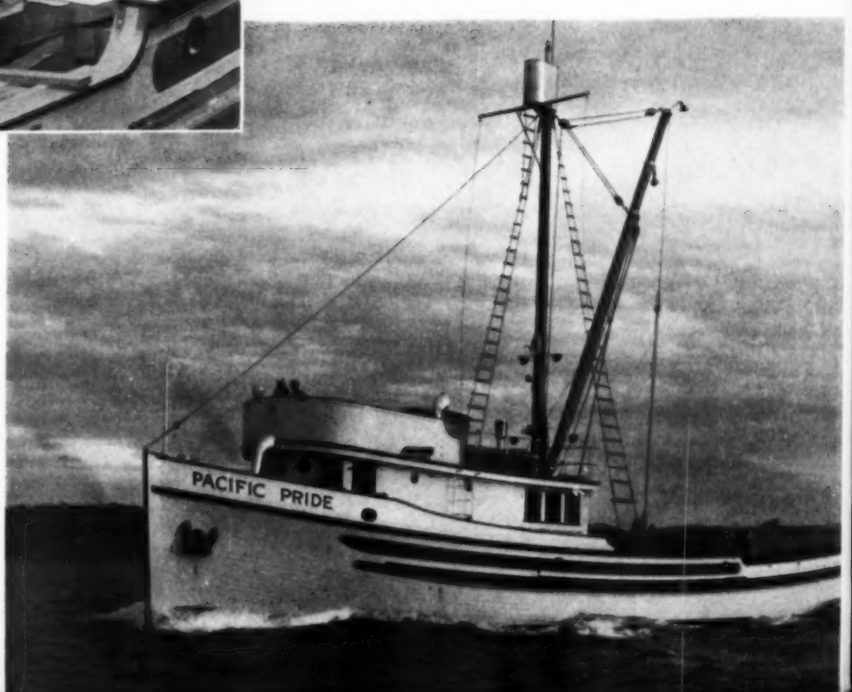
7. Due to the inventive turn of mind of a California equipment man, hundreds of the 32 volt Pullman axle railway car generators have been converted for use in Northwest fishing vessels. Ideally suited, waterproof, variable speed drive and voltage regulation, spring mounting, etc., fully enclosed, they are every bit as useful in fishing vessels as underneath a Pullman car. Conversion of Pullman electric equipment to heavier generator sets to handle air conditioning load made a surplus of discarded Pullman generators for marine use.

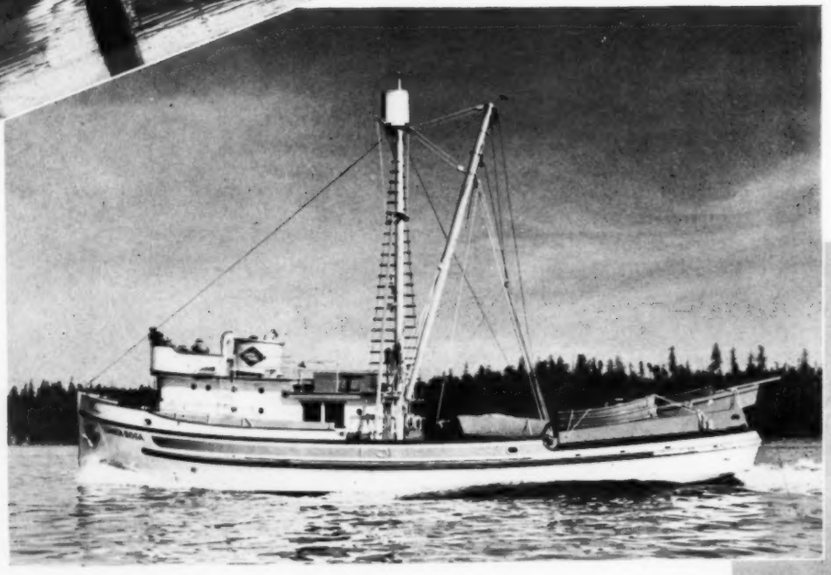




PETERSON & JOHNSON yard, at Tacoma, finished five or six fine ships, including an 80 and a 77 foot seiner: The "Nordic Pride", for Arnulf Berg of Tacoma, and the "John B.", a 77 footer for John Brescovich of Tacoma. The "Madeline", a 40' x 12' x 6' 6" troller, was built for Charlie Hansen of Seattle. This vessel has the first Lanova type Diesel ever installed on the Coast. It is an 80 hp. 6 cylinder Mack-Lanova (illustrated above), very compact and vibration free and very quiet. The "Patricia", 42' x 13' x 6', has a 35 hp. Caterpillar marine Diesel, while the "J.B.", named for her owner, John Bogen, of Ketchikan, Alaska, has a 100 hp. Cummins Diesel.

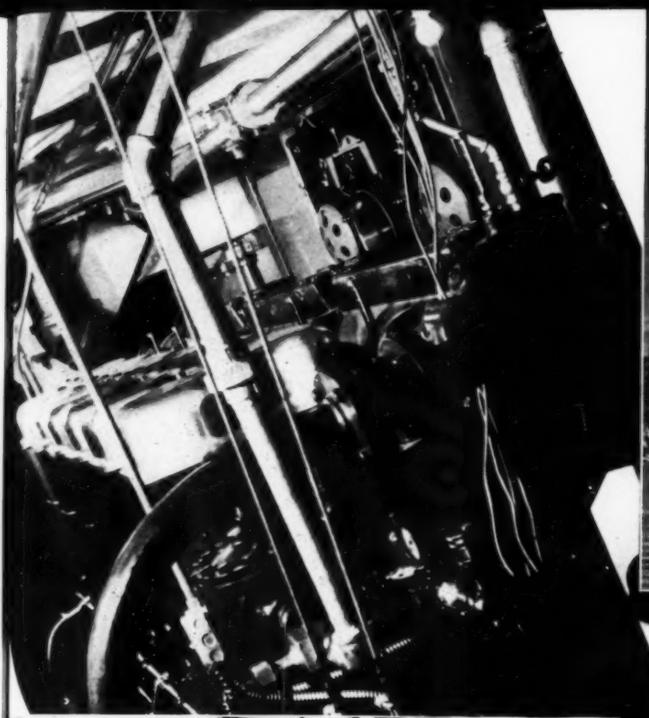
MOJEAN & ERICSON yard, while standardizing on pleasure cruisers on a line-production basis, completed the "Pacific Pride", a 77' x 19' x 10' seiner, for Ness, Selleride & Hansen of Seattle. She has a 240 hp. Washington Diesel, 32 volt Exide battery set, and line shaft drive, as well as open top upper pilot house. Illustration shows the Washington Diesel being hoisted aboard the "Pacific Pride".

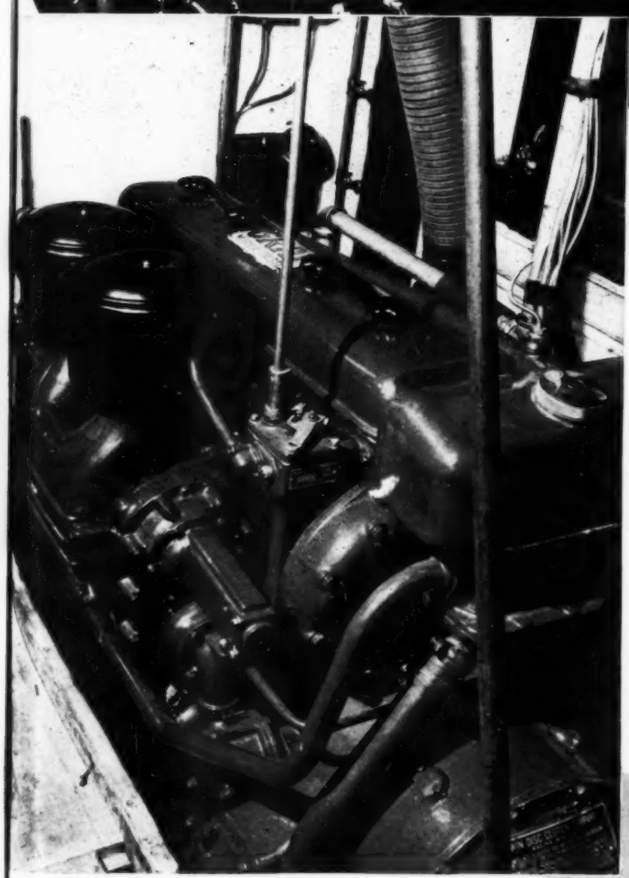




MARTINAC SHIPYARDS in Tacoma have just completed one of their busiest seasons on record. During the 1940 season, they finished six giant type seiners, the smallest being 84 feet long. *The Cavalcade,* 92′ x 24′ x 11′, for Far North Pkb. Co., has a 400 hp. 6 cylinder Atlas main engine and a 50 hp. auxiliary. She has a line-shaft deck machinery drive, 280 ampere hour Exide battery set, 6-ton Baker ice machine unit for fish hold cooling, cork insulated fish hold with 200 ton capacity, Coolidge bronze propeller and bronze tailshafting. A nifty, giant ship of the highest type. The usual fancy interior finish. *Redeemer,* 84′ x 21′ x 10′ 6″, is powered with a 235 hp. Union Diesel and has a a capacity of 160 tons of fish. She was built for Sal Di Mercurio of Monterey. *Aurora,* 84′ x 22′ x 10′ 10″, has a 235 hp. Union Diesel, 160 tons capacity, and was built for Frank Gondolfo of San Francisco, California. *Pacific Star,* 87′ x 23′ 6″ x 11′, was built for Sam Lanero of Monterey, and has a 300 hp. 6 cylinder Atlas Diesel and a 50 hp. Atlas auxiliary. She has a 1½ kw. Westinghouse generator and a 110 volt system with Exide storage batteries, and 180 tons of fish capacity in her big hold. *Joe Di Maggio* owned by Joe Di Maggio of Monterey is a 93.6 x 24 x 11 footer and has a 400 and a 50 hp. pair of Atlas Diesels, Timken roller bearings on all auxiliaries, Photo Electric pilot and all the trimmings, and 200 ton fish capacity for sardine and tuna. The *California Bear* and *Cutino Bros.* were subcontracted to Tacoma Boat Building Co.

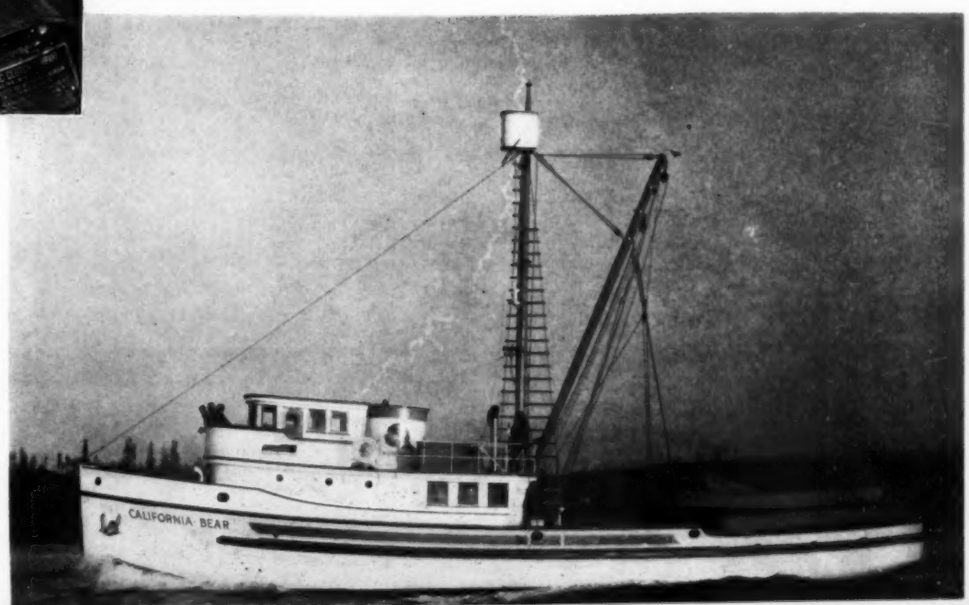
MARTINOLICH SHIPYARD, in addition to rushing work on two 93 ft. seiners in their San Francisco shipyard, built five big seiners for California Sardine work: A 78 footer, the "San Jose", with a 225 hp. lightweight Fairbanks-Morse Diesel was built for A. C. Martinolich; the "Santa Rosa" and "New Hope" (shown herewith), each 82 footers, were built for the Brothers Ventimiglia of Monterey —Salvatore and Leonardo. Each have 240 hp. Fairbanks-Morse lightweight Diesels. "The Lina V", for John Spadero, of Monterey, and "Twin Brothers" for Salvatore Maiorana of Monterey, both identical 82 footers, are powered with 350 hp. Enterprise Diesels.





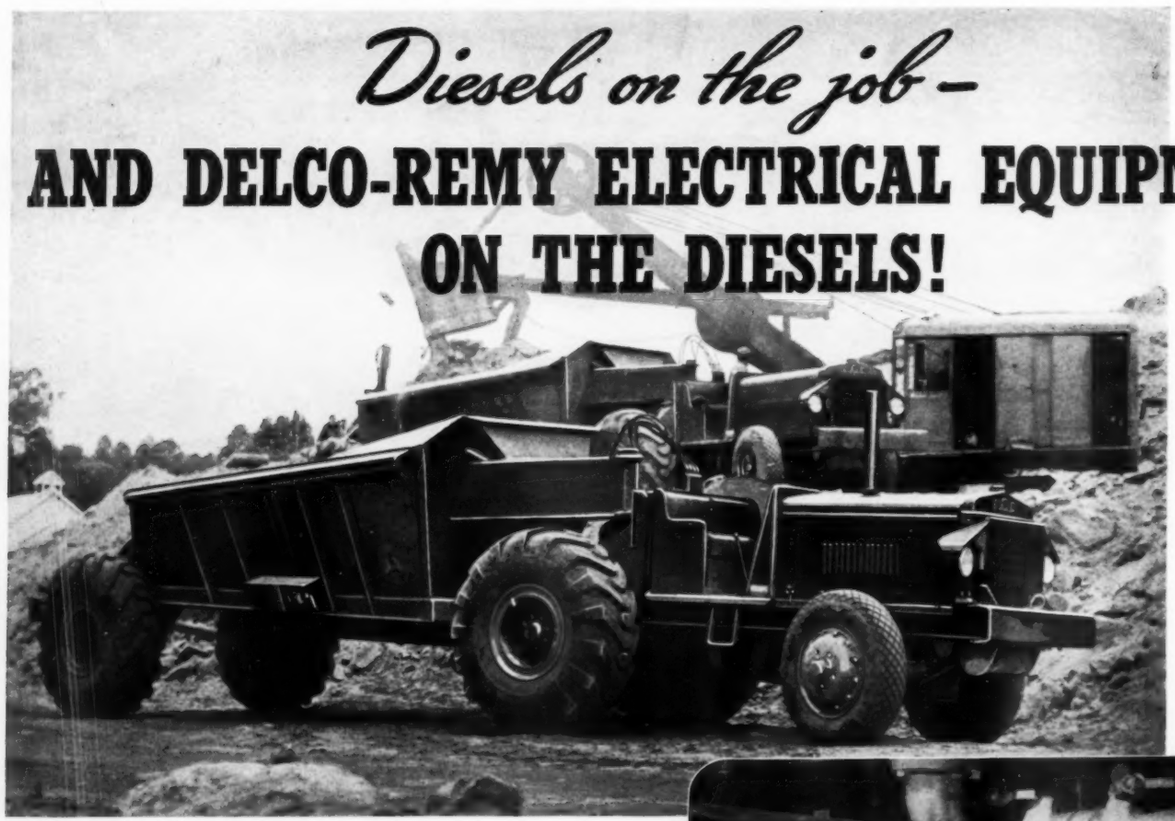
WESTERN BOAT BUILDING COMPANY, manned by the famous Petrich Family, father and several sons, turned out three big ones: "Western Queen", "St. Francis" and "Western Star". Giant tuna clipper "Western Pacific" will be finished before Christmas. Most interesting of their fleet was the 94 x 24 x 11 ft. draft "St. Francis", first purse seiner built entirely minus a turntable for the seine nets. She was built for Capt. Hubert Ursich and Anton Anticevich of Tacoma. Capt. Ursich, one of the youngest fishing vessel captains on the Pacific Coast, is only 26 years of age. She will carry a gross load of about 260 tons and carries 13,000 gallons of fuel bunker space. She is powered by the 250 hp. 12" x 15", 6 cylinder, 350 rpm. Enterprise direct reversing Diesel in upper left hand view, and a Coolidge propeller, giving her a maximum of eleven knots. A self-contained heat exchanger gives her fresh water cooling. A 2 kw. and a 1½ kw. Westinghouse belt driven generator pair, one on a 70 hp. Atlas Diesel auxiliary engine and one on the main engine flywheel, keep a 110 volt Willard storage battery set charged. She carries 75 watt radio, two-way, and a complete photo electric pilot, direction finder, searchlight and interior telephone set. Elimination of the turntable saves 3 tons dead weight, $1,000 cost and eliminates danger to crew in storms and speeds up operations.

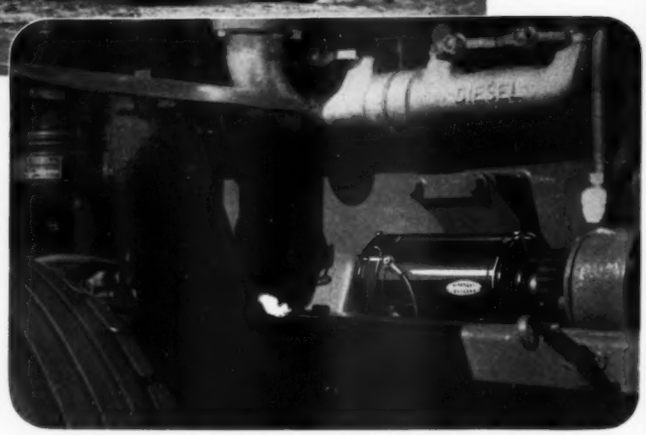
TACOMA BOATBUILDING CO. recently enlarged their yard and turned out the largest number of local boats during the 1940 season. They sub-contracted the "Cutino Bros." and "California Bear", two 83' x 21' x 10' 6" seiners with 200 hp. Atlas Diesels, from the overcrowded Martinac Shipyard further up the City Waterway. The "Key West", an 83 footer for Ole Hanney of Seattle, has a 260 hp. Enterprise Diesel and Exide battery set. Among the large group of halibut boats and trollers, the "Alrita", 58' x 15', for Sver Jangard of Seattle, is unusual for her power. She has a 160 hp. 6 cylinder Gray Marine Diesel (shown above) with Twin Disc Clutch, giving her plenty of smooth, quiet speed. A 75 hp. Atlas, a 100 hp. Buda and a 35 hp. Bolinders, were some of the assorted kinds of Diesels going into the Company's 1940 fleet of smaller fishing vessels.



Diesels on the job—

AND DELCO-REMY ELECTRICAL EQUIPMENT ON THE DIESELS!





Highway grading is a "Diesel-size" job, and these big Bottom-Dump Diesel trucks have what it takes to get work done at low cost. The dependability and low maintenance cost of the equipment are further assured by the use of Delco-Remy electrical equipment for Diesel engines.

Delco-Remy Cranking Motors, Generators, Regulators, Switches and 12-volt Delco Diesel-Type Batteries are built to meet the specific requirements of heavy-duty service on all Diesel applications—automotive, stationary and marine.

Among Delco-Remy's contributions to the Diesel industry is the Delco-Remy Cranking Motor with Dyer Drive, which provides for positive engagement of the pinion with the flywheel ring gear before torque is applied by the cranking motor. Extra-heavy-duty 12-volt Delco-Remy Cranking Motors furnish ample cranking power for the smaller Diesel engines, and for the larger engines the Delco-Remy Series-Parallel Switch permits the use of a 24-volt starting system with the conventional 12-volt generating, lighting and accessory equipment.

UNITED SERVICE MOTORS

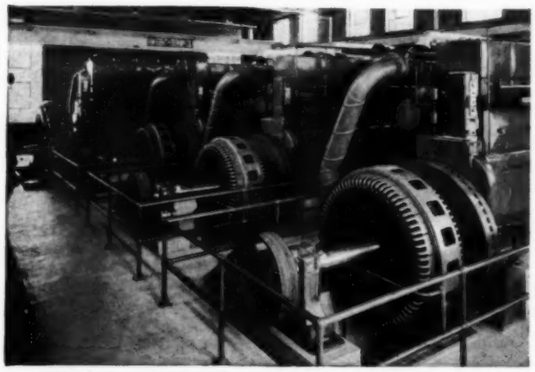
Service and service parts for Delco-Remy electrical equipment are provided through United Motors Service branches and distributors located in all parts of the country.

Delco-Remy

ANDERSON, INDIANA

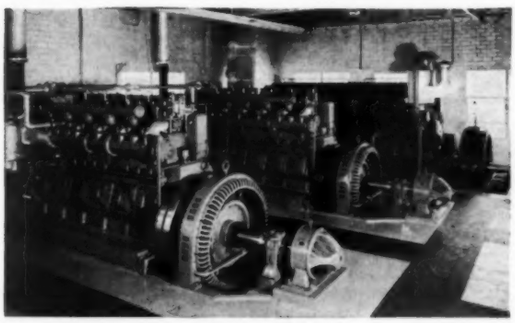
WORLD'S LARGEST MANUFACTURER OF AUTOMOTIVE ELECTRICAL EQUIPMENT

Worthington Diesel and Gas Engines for Municipal Power Service



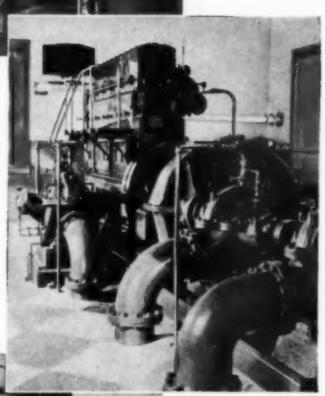
A 2500 horsepower Diesel municipal power plant

IN power and light, water works and sewage disposal plants, Worthington engines are delivering low cost power. Maintaining high operating efficiency and uninterrupted performance over years of service, they are bringing real earnings. In your plant the same possibilities may exist.



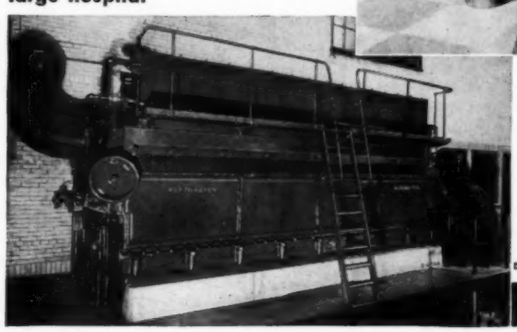
A 2200 horsepower Diesel installation in a rural electrification plant

A 365 horsepower gas engine, operating on sewage gas in a sewage disposal plant



At right . . . A 280 horsepower Diesel engine driving centrifugal pumps in a municipal water works

An 800 horsepower gas engine, operating on natural gas, generating power and light for a large hospital



Worthington's staff of qualified engineers will be glad to make a thorough study of your power problem and submit a strictly unbiased opinion and recommendation for your individual conditions. The competency of such recommendations is attested by an enviable record of substantial savings in hundreds of Worthington installations in every type of service.

DIESEL ENGINES 30 to 1500 h. p. **GAS ENGINES** 30 to 1800 h. p.

CONVERTIBLE GAS-DIESEL ENGINES 30 to 1800 h. p.

For continuous operation at medium speeds

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Decatur, Illinois

Supervisor of Construction
Pat Tiernan
Tiernan Engineering Co.
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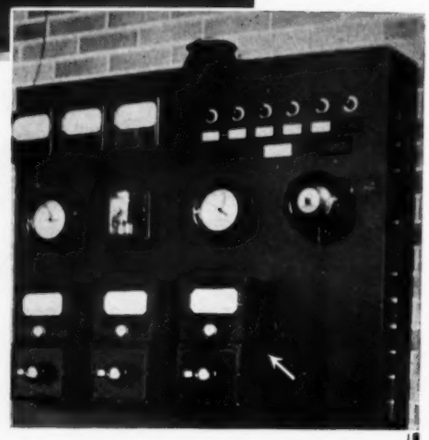

Bushnell, Illinois—A Distinctive Diesel Plant Protected by "Alnor" Pyrometers

View above shows the instrument panel with three "Alnor" Pyrometers at lower left.

The new electric light and power plant at Bushnell, Illinois, consists of three 300 hp., 4 cylinder, Type 32E14 Fairbanks-Morse Diesel Engines.

This plant embodies every modern feature including the best protective devices obtainable. It is significant that among the principal instruments are three "Alnor" Combination Pyrometers, one for each engine used, to give instant and constant temperature information of the cooling water and lubricating oil, as well as exhaust temperatures of each engine cylinder.

"Alnor" Pyrometers are serving many distinctive Diesel powered vessels of all classes, as well as distinctive and outstanding municipal and industrial Diesels.

Buy or Specify "Alnor."

Ask for Catalog.

Illinois Testing Laboratories Inc.

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423 NORTH LaSALLE STREET, CHICAGO, ILLINOIS

MANUFACTURERS OF "ALNOR" AND PRICE INSTRUMENTS

PRODUCTS OF 40 YEARS' EXPERIENCE

Latest Diesel Patents

A description of the outstanding patented inventions on Diesel and Diesel accessories as they are granted by the United States Patent Office. This information will be found a handy reference for inventors, engineers, designers and production men in establishing the dates of record, as well as describing the important Diesel inventions.

Conducted by C. CALVERT HINES*

2,183,284

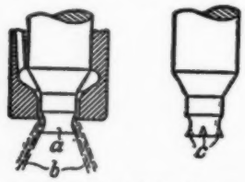
FUEL-INJECTION PLUG-NOZZLE FOR DIESEL MOTORS

Paul Wiebicke, Nuremberg, Germany

Application July 27, 1938, Serial No. 221,543

In Germany July 28, 1937

3 Claims. (Cl. 299—107.1)



1. A Diesel-motor, fuel-injection nozzle comprising a needle valve stem having a conical end for cooperation with a seat to regulate the amount of fuel injected, and an extension of smaller diameter than said needle valve stem projecting from said conical end, the outer end portion of said extension flaring toward its outer end to cause the injected fuel to be delivered in the form of a hollow, conical jet, said extension further having side recesses opening at their outer ends through the outer end of said extension to permit some of the injected fuel to be delivered into the interior of the hollow, conical fuel jet, the inner ends of said recesses being disposed outwardly of the inner end of said flaring portion of said extension so that the fuel before passing through said recesses is directed laterally outward.

2,183,035

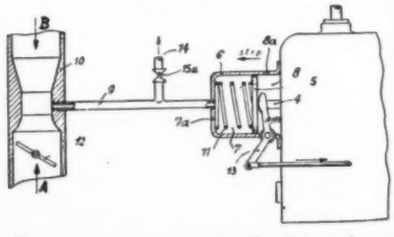
GOVERNOR FOR INTERNAL COMBUSTION ENGINES

Johannes Weber, Stuttgart-Feuerbach, and Hans Heinrich, Stuttgart, Germany, assignors to Robert Bosch Gesellschaft mit beschrankter Haftung, Stuttgart, Germany

Application July 14, 1936, Serial No. 90,588

In Germany July 29, 1935

12 Claims. (Cl. 123—140)



1. In a governor apparatus for internal combustion engines operating with injection of liquid fuel, a control member, means including a connection for connecting said control member to, and making it subject to the vacuum in, the induction pipe of the engine, said control member being adapted to control the fuel injection amount, and valve means in said connection operable to prevent an abnormal pressure from being supplied to said control member in the direction for increasing the fuel injection amount.

* Patent Attorney, 811 E. Street, N.W., Washington, D. C.

An Announcement

TO ENGINE MANUFACTURERS WHO WISH TO IMPROVE THE APPEARANCE OF THEIR ENGINE-GENERATOR UNITS

Here is the NEW General Electric High-speed Synchronous Generator

IT'S GOOD LOOKING

You can see that for yourself—note the compact, streamlined exciter. This new high-speed generator will meet any of your requirements, and it can be adopted as standard throughout your whole line.

IT'S ADAPTABLE

Any special requirements in respect to power-factor, frequencies, voltages, or efficiencies are easily met. New collector end shields are so designed that this generator is easily adapted to many mechanical modifications—drip-proof, splashproof, and enclosed forced- or self-ventilated constructions.

IT AFFORDS PROTECTION

The poles are held to the rotor spider by a strong, newly applied dovetail designed for utmost reliability. And the new exciter provides protection from live parts.

IT'S RELIABLE

The stator wedges are not affected by water or age, and will hold the coils in the slots permanently in position. The coils are form wound and are completely insulated before being placed in the slots, and no separate slot armor is used. This prevents shrinkage or deterioration and keeps the coils from loosening in the slots. And the protected exciter prevents damage from carelessness in handling.

This clean-lined, condensed G-E generator embodies the latest features of design, based on fifty years' experience in building reliable generators. Connect this generator to your machine and you'll have a unit that is attractive, flexible, compact, and safe to operate. And it'll be tailor-made to meet your requirements. You can place an order at any G-E office, or with General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

2,191,042

INTERNAL COMBUSTION ENGINE OF THE LIQUID FUEL INJECTION COMPRESSION IGNITION TYPE

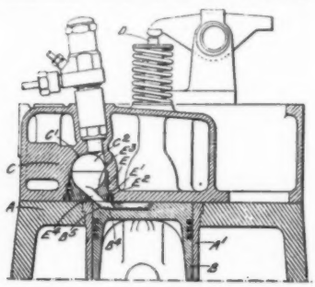
Harry Ralph Ricardo, London, England

Application July 25, 1938, Serial No. 221,208

In Great Britain July 29, 1937

3 Claims. (Cl. 123—32)

1. An internal combustion engine of the liquid fuel injection compression ignition type comprising in combination a cylinder, a detachable head for the cylinder, a piston in the cylinder, the opposed faces of the head and piston adapted to be disposed closely together at the end of the compression stroke of the piston, thereby reducing the clearance between them as far as is permitted by mechanical clearance, a pocket-like combustion chamber formed and disposed externally of the cylinder and opening toward the same, a plug member arranged in the mouth of said chamber and having a passageway therethrough, said passageway terminating in an orifice, a fuel jet device disposed in said chamber for delivering a charge of fuel towards a point in the wall of said chamber, a recess formed in one of the said opposed faces, said recess, which is open to the cylinder bore, being so formed that it is substantially circular in plan and being combined with a groove which runs into said recess and enters it tangentially, the outer end of said groove being adapted to lie opposite to said orifice at least at the end of the compression stroke, said recess with said groove constituting a local increase in the otherwise reduced clearance between the piston and cylinder head, the total combustion space available at the end of the compression stroke being comprised by the volumetric content of the external chamber, the passageway through the plug, the recess and the remainder of the clearance between the face of the piston and the end of the cylinder, of which total combustion space not more than 50% is in the external chamber and the said passageway.



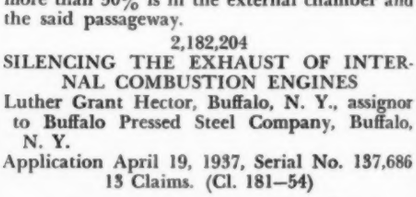
2,182,204

SILENCING THE EXHAUST OF INTERNAL COMBUSTION ENGINES

Luther Grant Hector, Buffalo, N. Y., assignor to Buffalo Pressed Steel Company, Buffalo, N. Y.

Application April 19, 1937, Serial No. 137,686

13 Claims. (Cl. 181—54)



1. A muffler having an open ended continuous conduit which receives gases at one end thereof and which has a discharge opening therein spaced from the other end thereof, and a substantially closed chamber in which said other end of said conduit terminates, the wall of said chamber having perforations to reduce natural resonance of said chamber, whereby most of the gases discharged into said chamber are returned to said conduit and discharged through said opening therein.

2,185,157

IMPROVED DIESEL FUEL

Edwin M. Nygaard and George S. Crandall, Woodbury, N. J., assignors to Socony-Vacuum Oil Company, Incorporated, New York, N. Y., a corporation of New York

No Drawing. Application November 30, 1938, Serial No. 243,117

2 Claims. (Cl. 44—9)

1. The method of accelerating the ignition of liquid fuels in an internal combustion engine of the type wherein ignition of the fuel is spontaneously effected by injection into the compressed air in the engine cylinder which comprises admixing with the fuel prior to ignition a minor portion of tetranitro methane.

2,182,988

ENGINE BALANCING

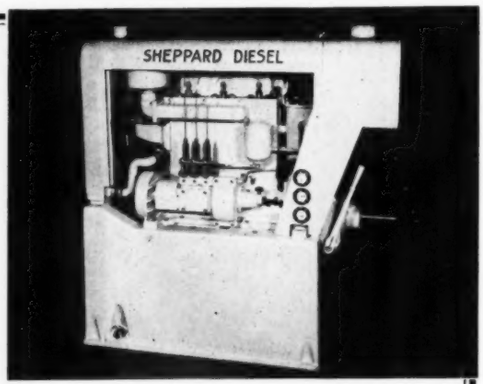
Charles W. Iseler, Detroit, Mich., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application September 11, 1936, Serial No. 100,263

2 Claims. (Cl. 74—604)

1. In a nine-cylinder W-engine the combination which includes cylinders arranged in three banks, the central bank being at a 45° angle with respect to right and left banks, pistons and connecting rods for each cylinder, a three-throw crankshaft having crankpins at 120° intervals, weights fixed to the crank cheeks to maintain centrifugal balance, additional weights

100 % Complete... 100 % Portable



The Model 6 Sheppard Diesel packaged power unit is delivered to you completely equipped, ready to drive—

AIR COMPRESSORS: 140 cu. ft. per min. at 80 lbs. gauge.

GENERATORS: 15 K.W. continuous rating.

HAMMER MILLS: 2500 lbs. barley or shelled corn; 3000 lbs. wheat; 1800 lbs. of oats per hour.

HOISTS & WINCHES: Lift 7000 lbs. 100 ft. per min.

ROCK CRUSHERS: 11 to 21 tons of 1½" stone per hr., depending on hardness of material.

ICE MACHINES: 15 Std. Tons of refrigeration per 24 hrs.

PUMPS: 2000 gal. per min. with 25 ft. head.

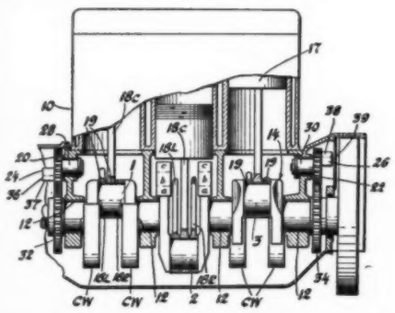
IRRIGATION: 106 acres 1" deep per 24 hrs. with 25 ft. head.

Send us your power problems

R. H. SHEPPARD COMPANY

HANOVER, PENNSYLVANIA

fixed to the crank cheeks to balance primary inertial couples of the right and left banks, a crankshaft gear at each end of the crankshaft, a pair of gears having eccentric weights thereon



driven from each of said crankshaft gears at crankshaft speed but in opposite directions for completely balancing primary inertial couples in the central bank, the weights on one of said pair of gears being displaced 180° with respect to the other pair, a second pair of gears at each end of the crankshaft having eccentric weights thereon driven by said first pairs of gears at twice crankshaft speed, the eccentric weights on one of said second pairs being displaced 180° from those on the other of said second pairs so that secondary inertial couples in the right and left banks will be balanced, and two other gears having eccentric weights thereon to completely balance the secondary inertial couple of the central bank, one of said latter two gears being driven by one of said first mentioned pair of gears and the other of said latter two gears being driven by the second of said first mentioned pair of gears at twice crankshaft speed, the eccentric weights being displaced 180° from each other.

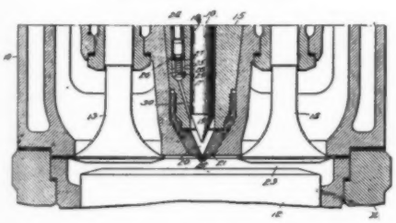
2,190,015

OIL ENGINE

Clessie L. Cummins, Columbus, Ind., assignor to Oil Engine Development Company, Columbus, Ind., a corporation of Indiana

Application January 29, 1938, Serial No. 187,637

4 Claims. (Cl. 123—33)



4. An injecting device for an oil burning engine of the piston type comprising a body having a chamber provided with one or more ejection ports and a passage for supplying the chamber with fuel under pressure, the ejection ports providing communication with the combustion space of the engine cylinder and through which air is forced during the compression stroke of the piston to mix with fuel delivered into the chamber, and an injecting plunger reciprocable in the body to alternately provide for the delivery of fuel to the chamber and to discharge the fuel through the ejection ports, the plunger having a surface located to direct toward the ejection ports the fuel charge issuing from the delivery port of the passage when the plunger is in retracted position and another surface for sealing the port during injection, the ejection ports being located to direct air forced into the chamber by the piston against the first-named surface to distribute the same.

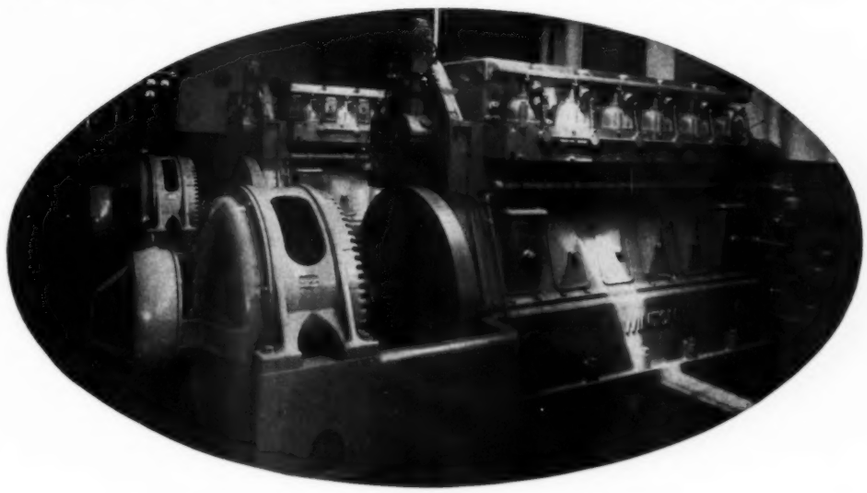
ANOTHER DIESEL FOR GRAND HAVEN

THE City of Grand Haven, Michigan, has awarded a contract to the Nordberg Manufacturing Company for the purchase of a 3850 hp. Nordberg Diesel engine and a 2715 kw. alternator. The engine will have nine 21½" x 31" cylinders and turn 225 rpm. The engine is of the two stroke cycle type and will be equipped with an air injection fuel system for burning heavy grades of fuel.

This new unit will be the fifth Diesel engine in the Grand Haven plant, and will bring the total Diesel horsepower of the plant to a total of 9400. The present plant includes three 1100 hp. De La Vergne Diesels installed in 1931, and one 2250 hp. Nordberg Diesel installed in 1937. Installation of the recently purchased engine will be completed in April.

Mr. J. Bryan Sims, an active member of the A.S.M.E. Oil and Gas Power Division, is Superintendent of Utilities for Grand Haven.

SERVICE PROVED Lubricants Assure Dependable Performance



Trick oils may look impressive in short demonstrations, but if you want Diesel oils that will give dependable, consistent performance—every day—every week—every month — you will want an oil that has proved its worth. Not an experimental oil but one that has been service proved — a Cities Service oil, engineered for the job.

Experience has shown that no one oil will prove most effective and economical for a given make of engine under all conditions of operation. Such factors as power output, crankcase oil temperatures, etc., may as often as not make the use of a cheap oil expensive and an expensive oil cheap. Let one of our lubrication engineers tell you why — and prove it on your own equipment. Mail the coupon to us or write us on your own letterhead.

In any event you will benefit from reading a copy of our new booklet on "Diesel Engine Lubrication." Sent free to any user of Diesel engine oil.

CITIES SERVICE DIESEL LUBRICANTS

CITIES SERVICE OIL CO.
SIXTY WALL TOWER—ROOM 1626E, NEW YORK, N. Y.

Please send me information concerning your Engineers' Lubrication Service_____

Please send me a copy of your *free* folder "Diesel Engine Lubrication" _____

Name _____

Firm Name _____

Business Address _____ *City* _____

The **YM** *Lube Oil Purifier*

HAS A VERY GREAT ADVANTAGE . . .

IT USES CONTACT FILTRATION INSTEAD OF PERCOLATION

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That's why YM is used by the Navy for Submarine Diesel Oil Purification, by most Engine Builders, and by Oil Companies to serve their own generating plant and pipe line engines . . . Write or wire for information and name of a user near you.

CLEAN OIL — CLEAN ENGINES

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YOUNGSTOWN MILLER CO., INC.

LOCK BOX Y929 · SANDUSKY, OHIO

Specify
Quincy
COMPRESSORS
For Dependable Diesel Starting Service
Hundreds of Diesel installations throughout the country have proved the dependability of Quincy Compressors for starting service. Many leading Diesel manufacturers furnish Quincys as standard equipment. Modern design and new operating features assure outstanding over-all efficiency. Construction is simplified. Radiation is 12% greater. Lubrication is more thorough — more positive. There is a Quincy Compressor ideally suited to every Starting Service requiring intermittent pressures up to 500 lbs. per sq. inch. Models available with either gas engine or electric drive or a combination of both. Remember! Specify Quincy for dependable Diesel Starting Service!
Only Quincy Offers All These Features
1. Timken Roller Bearings. 2. Semi-Steel Pistons. 3. Perfectly Balanced Crankshaft. 4. Cushioned Steel Valves. 5. Lynite Rods. 6. Constant Level Oiling. 7. Improved Cooling. 8. Nickel Chrome Castings.
QUINCY COMPRESSOR CO., 4110 Main St., Quincy, Ill.
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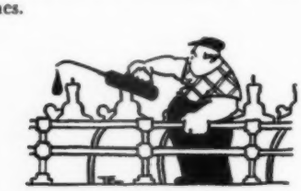
GET NEW FREE BOOK
Contains Complete Information on Quincy Compressors for Diesel Starting Service.

D. C. PETERSON, formerly Vice President in Charge of Manufacture of The Buda Company, has been appointed Works Manager of The Superior Engine Division of The National Supply Company.

Following his mechanical and electrical engineering education at Armour Institute of Technology, Chicago, Mr. Peterson became associated with The Buda Company, Harvey, Illinois, in 1915. In this connection he served successively as Plant Engineer in Charge of all Mechanical and Electrical Operations, Divisional Superintendent of Railway Motor Cars and Engine Divisions, and for eight years as General Superintendent and Assistant to the Vice President in Charge of Manufacture.

In 1934, Mr. Peterson affiliated with The Continental Can Company, New York City, as Chief Engineer of the tinplate mills. In this capacity he spent two years in Europe constructing and organizing tinplate mill operations for the British combine known as the Metal Box Company, Ltd., London. Upon returning from Europe he was assigned to special surveys of the Steel Industry in the United States and Canada and also had charge of rehabilitation of various Continental Can factories throughout the country.

In the summer of 1939, Mr. Peterson returned to The Buda Company as Vice President in Charge of Manufacture and has during the past year constructed and placed in operation two plants for the manufacture of radial Diesel engines.



THE Hilliard Corporation, Elmira, New York, announces the appointment of John J. Collins, 1830 Railway Exchange Building, St. Louis, Missouri, who will represent them in the sale of Hilco Oil Reclaimers in the St. Louis territory.

MAX ROTTER

IT IS with deep degret that we learn of the death of Mr. Max Rotter who has long been known as the Dean of American Diesel engineering. Mr. Rotter passed away on October 6 at St. Louis, Mo., at the age of 73. The cause of his death was attributed to a heart attack.

Beginning his engineering career in England in 1883, he came to the United States in 1892 and served as Mechanical Engineer with Walker Manufacturing Company of Cleveland, then with Fraser & Chalmers of Chicago, and later as special engineer to the Board of Directors of the Allis-Chalmers Company.

In 1912 Mr. Rotter became Chief Engineer of the Busch-Sulzer Bros.-Diesel Engine Company and later served for many years as Vice-President in charge of Engineering, supervising development of stationary, marine, and submarine Diesel engines. His many friends throughout the Diesel industry will share our sense of loss at his passing.

UNITED STATES ARMY ARMORED DIVISION GOES DIESEL

THE first contingent of 100 selected soldiers from Fort Knox and Fort Benning began intensive Diesel training at the Hemphill Diesel School, 515 S. Western Avenue, Chicago, Illinois, on October 7. These men have been

selected particularly for their mechanical ability and are taking Diesel training in preparation for servicing Diesel engines that are being installed in the equipment of the armored force division.

The troops are quartered at Fort Sheridan for the duration of the course, which lasts for

BUSHNELL LIGHT PLANT

USES

MAXIM

SILENCERS

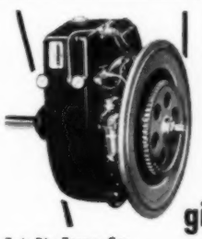
• Three Maxim Exhaust Silencers quiet Diesel exhaust noise for The Municipal Light Plant at Bushnell, Illinois.

It is significant that in cases of this sort, where good public relations demand noise free operation (Note proximity of private residence in photograph), you'll find Maxim's time after time.

Consult Maxim for the answer to YOUR silencing problems.

THE MAXIM SILENCER COMPANY

94 Homestead Ave. Hartford, Conn.

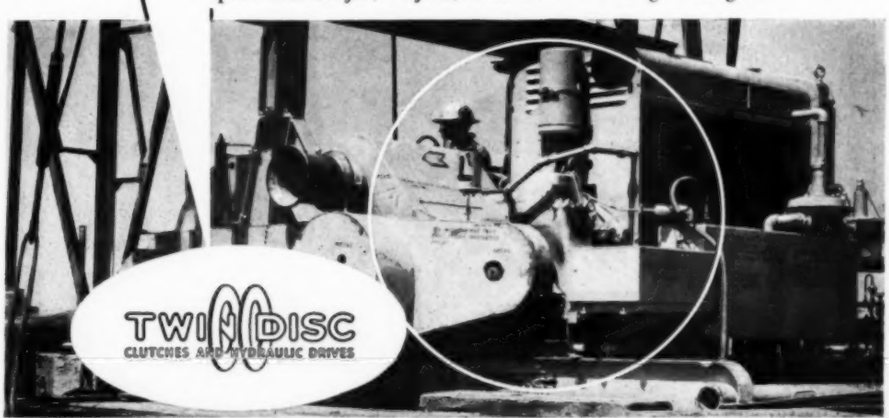


Twin Disc Torque Converter on a Cardwell draw-works powered with a Waukesha engine.

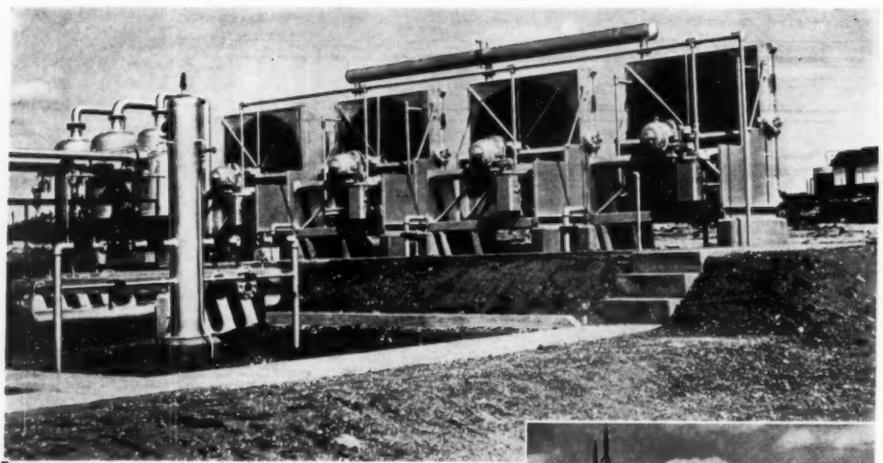
The Twin Disc Torque Converter

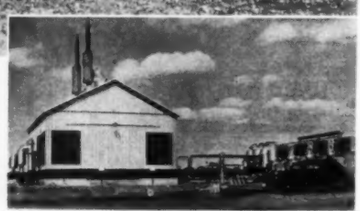
gives you an unlimited automatic gear selection

When your internal combustion engine is equipped with a Twin Disc Torque Converter, you have at your finger tips, the equal of an unlimited automatic gear selection in any desired ratio—but gears are entirely eliminated. The smooth, silent hydraulic drive automatically adjusts the speed of the load to the power input, giving you the high torque needed for starting, then automatically bringing the load up to speed with no jar, no jerk, no chance of stalling the engine.



TWIN DISC CLUTCH COMPANY • 1345 RACINE STREET • RACINE, WISCONSIN





Illustrated is a battery of Young, Master Series, Full Flow, Water & Power Conserver Engine Jacket Water Coolers. This installation is cooling the jacket water and oil in two 400 H.P. Cooper-Bessemer Gas Powered Compressors located at San Benavides, Texas, properties of the Continental Oil Company.

If you have problems in cooling gasoline, gas or Diesel engines, submit them to us—there is no cost or obligation.

Write for descriptive literature

A. R. Flourney, P. O. Box 191, Bell, California
Happy Belting Co., 310-312 E. Tenth St., Tulsa, Okla.

YOUNG RADIATOR CO., RACINE WIS.

Young Quality

A PROVED "PAY TOOL"

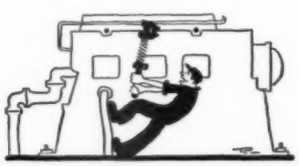
● When a construction man labels any piece of equipment a "pay tool", he means it is doing a profitable, dependable job. The Cummins Dependable Diesel is a proved "pay tool" because it does the job cheaper, faster, longer . . . on the biggest and toughest contracts . . . in all types of power machinery. Why cheaper? Because the Cummins Diesel makes a gallon of fuel last longer . . . because the Cummins Diesel costs less to maintain. Why faster? Because the Cummins Diesel has the high torque, the power to hold on in tough going . . . because the exclusive Cummins Fuel System provides supreme flexibility. Why longer? Because the Cummins Diesel is precision-built from highest quality materials to assure maximum strength and stamina. Give your equipment peak "pay tool" performance. Specify Cummins Diesel power. A complete line from 40 hp. to 500 hp. Cummins Engine Company, 2316 Wilson Street, Columbus, Indiana.

Model HBS-600 (supercharged) Cummins Dependable Diesel. 200 hp. at 1800 rpm.

CUMMINS Dependable DIESELS

several weeks, and are transported to and from the school daily by special trains on the North

Shore Line. Classes are conducted five days a week from 9 a.m. to 4 p.m. The regular civilian residential students are cooperating in this defense training program by taking training at evening instead of during the day, in order that the soldiers may be properly accommodated. The course of training is of an intensely practical nature on a large variety of American-made Diesel engines.



AUTOMATIC DIESEL EMERGENCY PLANTS FOR THE ARMY

EIGHT Bardco Diesel emergency standby plants will shortly be delivered to Fort Wright, New York, by the Bardco Manufacturing and Sales Co. in accordance with a contract from the War Department. Each of the Bardco generating plants will be equipped with Master AC generators and Hercules six cylinder Diesel engines, and will be rated at 25 kva capacity.

The Bardco units will incorporate the patented Bardco voltage regulator which functions and controls all phases without the use of moving parts in the regulator, special Bardco safety control and alarm systems, and other features developed by the Bardco Company during the past five years. Although specified for emergency standby service, the ratings are for continuous duty should load conditions demand.

These units will be similar to the many Bardco emergency plants that have been in service for a number of years at such motion picture studios as Warner Bros., Paramount, Twentieth Century Fox, Walt Disney, and others, where the plants automatically take over the load of the film development laboratories within three seconds of power interruption.

The 100-foot Diesel tug, "Crusader," of New York, on trial run

NO NOISE•NO SPARKS from the exhaust of this 805 Hp Diesel Tug

The "Crusader" embodies the finest in tugboat design. Its builders chose the latest development for preventing exhaust noise and eliminating flying sparks and soot —the Burgess SDM Centrifugal Spark Arrester-Snubber.

Sectional view of Burgess SDM Centrifugal Spark Arrester-Snubber.

In Burgess SDM Snubbers all solid particles are directed by centrifugal action into a carbon trap from which they are easily removed. Controlled snubbing of the slugs smooths the flow of gases, preventing noise. The engine exhaust reaches the atmosphere in a clean, noiseless stream.

If you operate or build motorships, the new Burgess Snubber Data Book will be valuable to you.

BURGESS
SPARK ARRESTER
SNUBBERS

Patents Applied For

Mail Coupon for Bulletin

Burgess Battery Company, Acoustic Division
Dept. DPR, 500 W. Huron Street, Chicago, Ill.

Please mail bulletin describing Burgess SDM Series Spark Arrester-Snubbers.

Name.....

Company.....

Address.....

Bardco engineers have perfected automatic starting equipment and control panel that transfer the load from the normal sources of power to the Bardco unit in three seconds or less, and have won a fine reputation for their equipment for emergency standby service.

Manufacturing headquarters for the Bardco Manufacturing & Sales Co. are now at Dayton, Ohio, although their executive offices remain at Los Angeles.

DIESEL ENGINEERS ELECT OFFICERS

THE Diesel Engineers International Association with Executive Offices at 576 Newark Avenue, Jersey City, N. J., has elected the following officers for the ensuing term:

President: Fred C. Congdon, Chief Engineer Unlimited
First Vice President: Dennis A. McCarthy, Chief Engineer Unlimited
Second Vice President: Alfred Bohrer Krest, Chief Engineer Unlimited
General Secretary-Treas.: Julius Rosbloom, Chief Engineer Unlimited

Members elected on the National Technical Advisory Board are as follows:

M. J. Dowd, Chief Engineer and General Supt., Imperial Irrigation District, Imperial, California.

F. K. Vance, Supt. & Chief Engineer, Water and Electric Dept., City of Neodesha, Kansas.

Clint Voorhees, Supt. & Chief Engineer, Public Works, City of Dowagiac, Michigan.

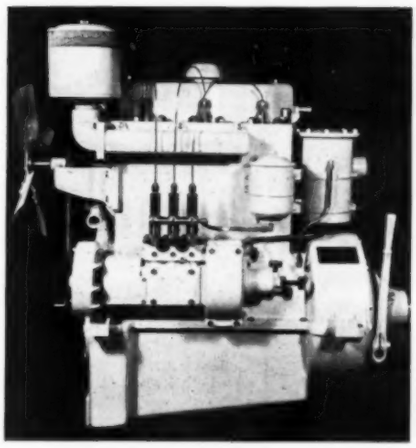
W. E. Ralls, Supt. & Chief Engineer, Municipal Diesel Utilities, City of Trenton, Missouri.

Thomas Moore, Plant Supt., Shenandoah Valley Electric Cooperative, Dayton, Virginia.

R. E. Doonan, Chief Engineer & Supt., Municipal Diesel Utilities, City of Waverly, Iowa.

Elmer Davenport, Chief Engineer, Diesel Power System, McMinnville, Oregon.

Bruce B. Watts, Chief Engineer & Supt., Municipal Utilities, Corning, Iowa.



SHEPPARD DIESEL
equipped with
FEDERAL-MOGUL
Cadmium-Silver
BEARINGS

To the ever-widening field of Diesel power, Federal-Mogul welcomes the R. H. Sheppard Company, and is proud to add their name to its growing list of Diesel engine builders using Federal-Mogul Connecting Rod and Crankshaft Bearings.

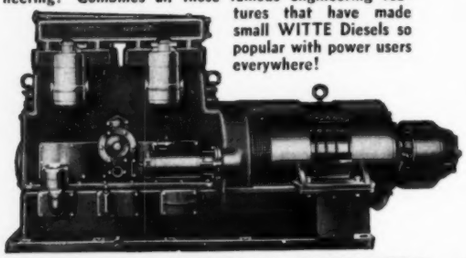
FEDERAL-MOGUL CORPORATION
Detroit, Michigan

FEDERAL Mogul

Especially Designed to Give You MORE POWER at LESS COST!

the NEW 30,000 WATT WITTE DIESELECTRIC PLANT

Extra power—extra quality construction—extra efficiency—extra low cost operation. That's what makes this new 40 H.P., 4 cylinder WITTE Dieselectric such an outstanding buy! A masterpiece of American engineering! Combines all those famous engineering features that have made small WITTE Diesels so popular with power users everywhere!



WITTE Dieselectrics operate on cheap, non-explosive fuel. Reduce fire hazards. Compact, sturdy, quality built. Easily operated by an average mechanic. Vertical or Horizontal. 2500 to 30000 Watts. 1, 2 and 4 cylinders. Manual Control, Electric Starting or Fully Automatic.

INVESTIGATE NOW — Get a WITTE Dieselectric and have the light and power you need—when and where you need it —at the amazingly low cost of **only ONE CENT a kilowatt.** Write for free literature.

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WITTE ENGINE WORKS, KANSAS CITY, MO.

METERING
WILL STOP LOSSES . . . CUT COSTS
IMPROVE EFFICIENCY IN YOUR PLANT

Pittsburgh Piston Meter for Measuring Oil Used by Diesel Engines.

There is only one accurate way to measure the oil consumed by Diesel engines—by meter. Diesel power requires accurate meter records to prove its economy. In addition, the careful daily analysis of meter readings will show up power loss at its inception and guard against overloads. Write for literature.

PITTSBURGH EQUITABLE METER CO.
PITTSBURGH, PENNA.

OUR 78TH YEAR
PICKERING GOVERNOR CO.
PORTLAND, CONN.

DIESEL ENGINES
are *Vital* to
NATIONAL DEFENSE
PROGRAM

The Diesel Engine is in the headlines today, more than ever before. Tanks — Trucks — Airplanes — Ships, all vital implements of National Defense, are now being powered with Diesels. Millions of dollars of government contracts have been let for Diesel-powered equipment . . . and Hemphill Diesel Schools are training men to operate and service all types of modern Diesel engines.

Note to Personnel Managers and Employers . . . .

When YOU need trained men to operate, repair or service your Diesel equipment — write the nearest

HEMPHILL DIESEL SCHOOLS
America's Original Exclusive Diesel Training School

All communications concerning graduates of Hemphill Diesel Courses should be sent to one of the following addresses:
31-28 Queens Blvd., L.I.C., NEW YORK • 519 South Western Ave., CHICAGO, ILLINOIS • 2121 San Fernando Road, LOS ANGELES, CALIFORNIA • 421 Monroe Avenue, MEMPHIS, TENNESSEE • 1365 Granville Street, VANCOUVER, B.C.

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Roy E. Boling, Chief Engineer & Supt., Diesel Light, Power and Water System, City of Pleasant Hill, Missouri.

W. J. Dettman, Chief Engineer, Diesel Power Plant, City of Rochelle, Illinois.

G. J. Woodhouse, Chief Engineer & Supt., Municipal Utilities, City of Harlan, Iowa.

D. R. Calhoun, Manager, Industrial Div., Wilkening Mfg. Co., Philadelphia, Pa.

MR. BOYCE W. KNIGHT, who since early in the year has been doing special survey work for the Young Radiator Company, has recently been appointed as special Representative in the Middle Western Territory to serve the Tractor, Truck and Industrial Radiator Division.

Boyce Knight was formerly with the Oliver Farm Equipment Company at the Chicago office and previous to that was Vice President of Ensign Carburetor Company handling sales.

Mr. Knight's headquarters are at the Company's main office and plant at Racine, Wisconsin.

NEW CATERPILLAR MARINE DIESELS

TWO new four-cylinder Diesel Marine engines have been announced by Caterpillar Tractor Co. at Peoria, Illinois. The addition of

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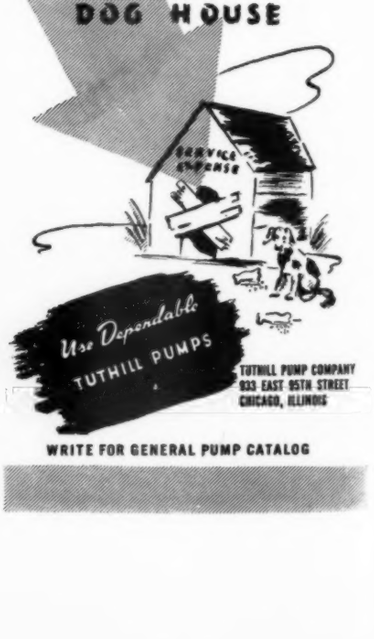
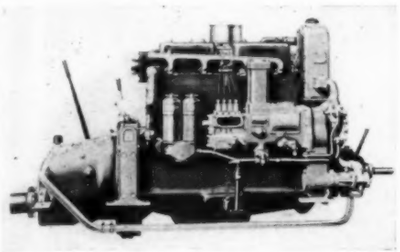


WRITE FOR GENERAL PUMP CATALOG

these two engines to the line gives the company a complete run of sizes from 25 to 135 bhp.



Like other Caterpillar Diesel Marine Engines, the new units are of medium speed and medium weight, especially well-suited for the work boat field. Ratings are conservative and the engines are characterized by mechanical simplicity.

The larger of the two new engines is the model D8800, which has a bore and stroke of 5¾" x 8", and develops 70 hp. at 900 rpm. The D7700 engine, with a 5¼" bore and a stroke of 8", develops 60 hp. at the same rpm. Ratings for these engines are unusually conservative. The figure given is for continuous service, which means full load operation day in and day out, throughout the year, if desired.

A closed type heat exchanger with gear driven centrifugal jacket water pump and gear type raw water pump is standard equipment on both engines. A water-cooled lubricating oil cooler is also provided. An independent two-cylinder, vertical, four-cycle gasoline engine is used to start the Diesel. Electric starting is available for both Diesel and starting engine, if desired.

The fuel system offers an individual injection pump for each cylinder. These pumps are factory set and require no adjustment while in service. The fuel injection valves are of the spring operated type, and when the pressure of the fuel oil, built up by the pump, overcomes the tension of the valve spring, the valve head lifts, and fuel is sprayed into the precombustion chamber through a single orifice. The comparatively large size of this orifice practically precludes ever having a clogged spray valve. Valves, like the pumps, are set at the factory and require no attention on the job. Both pumps and valves are of Caterpillar design and manufacture.

A spring loaded, flyball type governor is mounted on the camshaft gear. The engine is always under the control of the governor, so that the throttle lever is really the governor spring control. The throttle setting determines the approximate speed of the engine, and the

Investigate

BARDCO automatic standby and continuous duty ELECTRIC PLANTS

- 500 watts to 200 KW
- Fully automatic starting, stopping and synchronization
- Diesel, Butane, natural gas or gasoline engine driven

Get the facts..

on these electric generating plants and you'll find out why Bardco owners are so enthusiastic over their selection of Bardco equipment.

Whether your requirement is for an automatic emergency standby unit that must take over the load within 3 seconds of power failure, or a large continuous duty generating plant, you owe it to yourself to FULLY investigate the Bardco line.

Write to Dept. DPR-1

BARDCO MANUFACTURING & SALES CO.

4031 Goodwin Ave. Los Angeles, Calif. | 126 Davis Ave. Dayton, Ohio | Toronto, Ontario, Canada

HILCO Oil Reclaimers

COMPLETE—COMPACT—CONTINUOUS

There's a HILCO for every size Diesel Installation

A HILCO on the Wm. Penn will keep the lube oil and SUPERIOR Diesels clean . . . No oil changing or engine cleaning for these operators . . . Think of the savings in operating and maintenance costs.

Write for FREE literature—see what other operators are doing with HILCO Oil Reclaimers

The HILCO Oil Reclaimer will produce for you an oil free of carbon, sludge, moisture, fuel dilution, acid and tarry matter plus good color.

The HILCO is being direct-connected to one or more engines for continuous or intermittent by-pass purifying to remove contamination as fast as it is formed.

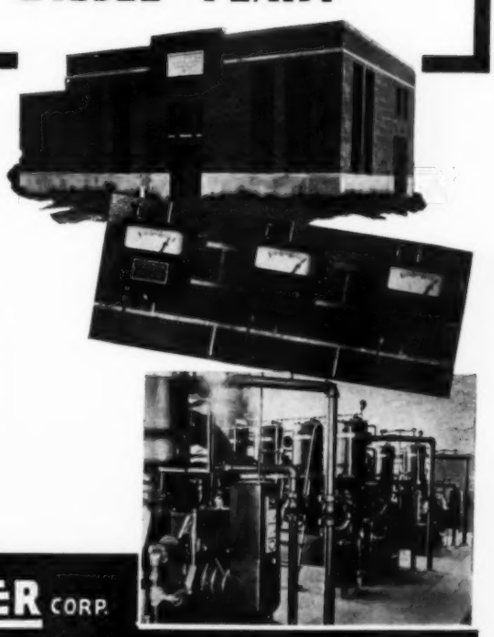
You may use The HILCO as a batch reclaimer if you prefer draining the lube system. A combination hookup can be arranged for both by-pass and batch operation.

There is a model having sufficient capacity for every Diesel installation.

THE HILLIARD CORPORATION

122 WEST 4TH ST. ELMIRA, N. Y.

LEVELOMETER GAUGES Installed By FAIRBANKS MORSE In BUSHNELL MUNICIPAL DIESEL PLANT



These LEVELOMETERS supply an important, trouble-free finishing touch—a means of obtaining an accurate report concerning the liquid levels of your oil tanks at any time. The fact that LEVELOMETERS have been installed in many similar plants throughout the country proves their versatility—their efficient functioning.

LEVELOMETER FEATURES

LEVELOMETERS operate on an exclusive adaptation of the hydrostatic principle . . . No liquid is used in indicator to be affected by temperature changes, to evaporate, stain glass or to be blown out due to excessive pumping . . . Easy to read dial—due to large graduations and numerals . . . Convenient remote reading—dial may be located at any reasonable distance from tank . . . Approved by Underwriters' Laboratories.

Get complete details regarding LEVELOMETERS — the remote reading gauge that insures an accurate check-up of liquid levels at all times.

THE LIQUIDOMETER CORP.

36-24 SKILLMAN AVE., LONG ISLAND CITY, N.Y.

AN EASY WAY TO CLEAN YOUR LUBE OIL COOLERS

Want to save time, save money in cleaning your oil coolers? Then investigate the successful, low-cost Oakite method. No dismantling of unit necessary! Circulation of recommended Oakite solution through system speedily, thoroughly removes carbonized oil deposits. Heat transfer efficiency is restored . . . lube oil is maintained at proper temperature. Interesting data FREE on request.

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22D Thames St., New York

OAKITE *Certified* CLEANING
MATERIALS & METHODS FOR EVERY CLEANING REQUIREMENT

NORDBERG
DIESEL ENGINES
STATIONARY—MARINE

Two Cycle Type
750 to 6500 H. P

Four Cycle Type
600 to 1500 H. P.

NORDBERG MFG. CO.
MILWAUKEE, WIS.

governor controls the fuel injection pumps to supply the quantity of fuel necessary to balance the load.

The Caterpillar Diesel Marine Engines are offered as unusually complete units. Equipped with Twin Disc reverse gear, they are ready for operation when but five connections have been made. It is only necessary to connect the exhaust to atmosphere, sea water suction to raw water line, heat exchanger outlet to overboard discharge, fuel oil line to main storage tank and to align the thrust bearing shaft and connect it with the propeller shaft.

Caterpillar Tractor Co., which in less than three years has become one of the country's large manufacturers of work boat Diesels, now builds eight sizes of marine engines.

THE Board of Directors and stockholders of Motor Improvements, Inc., manufacturers of Purolator Oil Filters, have adopted at recent meetings resolutions changing the company's name to Purolator Products, Inc.

It was made clear that this action does not reflect any organization change but was prompted by a desire to eliminate any possible confusion that may have existed when the corporate and product names were not similar.

At the same time, announcement was made that Purolator sales for the first eight months of 1940 were the largest for any comparable period in the company's history.

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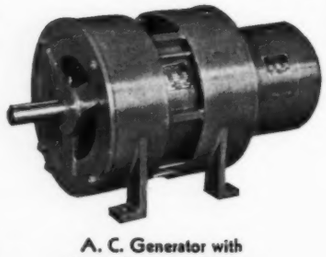

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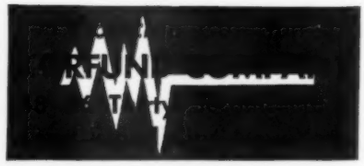

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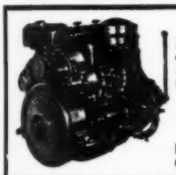

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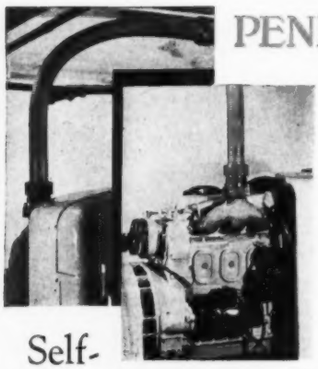

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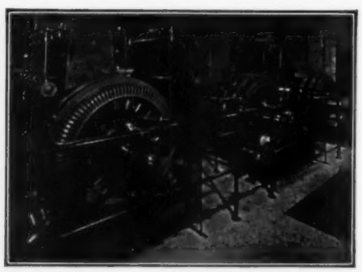

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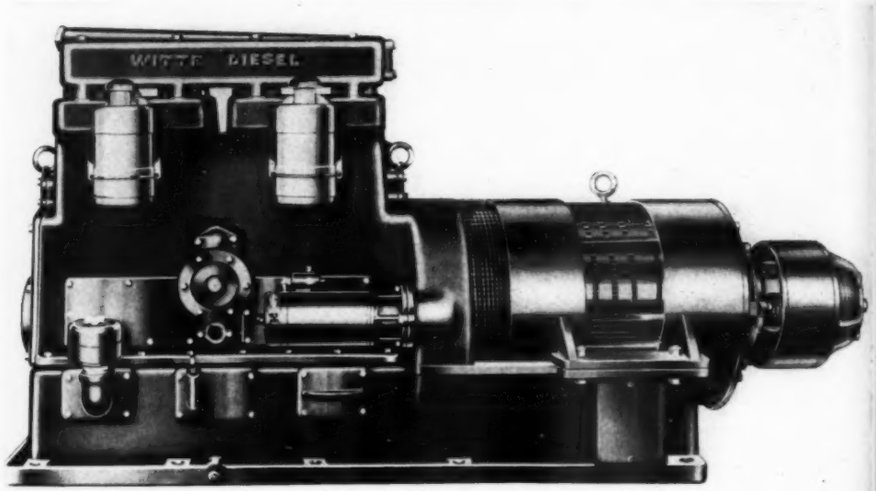

THE Witte Engine Works, long known as builders of Diesel engines for the small power user from 4 hp. up, has now added a 36-40 hp., 30 kva. Diesel generating unit to round out the upper bracket of its line.

The 36-40 hp. four cylinder Witte Diesel Engine is electrically started and has many features of construction hitherto confined to engines of 100 hp. and larger. Yet many parts are interchangeable with the 9 hp. single cylinder vertical engine. It is of enbloc construction with replaceable wet type cylinder liners. The drop forged crankshaft is well balanced with liberal main bearing area. Main bearings are heavy duty Babbitt lined steel shells. Spiral gear driven accessory shaft is mounted on Timken Roller Bearings, and all heavily stressed parts are of alloy steel. A Pierce Governor assures close governing, while built-in gear driven water circulating pump, thermostatic jacket water control and water cooled exhaust manifold guarantees ample cooling by radiator, tank, tower, or marine pump.

The cylinder head contains the combustion chamber, intake and exhaust valves and the fuel injection nozzle. Long life is assured by the use of silcrome steel valves, valve seat inserts and replaceable valve guides. The cylinder head being light and of simple form, valve servicing and inspection of the piston is thus greatly facilitated. Pistons are of sufficient length and carry four compression rings and one oil ring. The rings are well spaced below the piston crown, thus preventing seizing of the upper rings from excess heat.

The economy of Witte Diesel Engines and Dieselectric Plants is due to the exclusive Witte combustion system, which consists of two separate chambers: A—the main chamber, being the space between the top of the piston and the cylinder head proper. B—the pre-combustion chamber, being the main combustion chamber and the fuel injector. During the compression stroke, compressed air is forced into the pre-combustion chamber at high pressure and temperature. Near the end of this stroke, fuel injection begins, entering the pre-combustion chamber and igniting, causing a very rapid rise in temperature and pressure inside this chamber. The partially burning gases and remaining unburned fuel are discharged at high velocity through the venturi-shaped opening into the main combustion chamber, which striking the top of the piston near one side and at an angle of 30° from the horizontal spreads out in a fan-shape over the entire main combustion chamber, resulting in a very thorough mixing of the remaining unburned fuel with the hot combustion and maximum power with a minimum of detonation.

The crankcase is well ventilated with forced feed lubrication to cam and crankshaft bearings and forced flood lubrication to gears. Oil bath air cleaners, fuel and oil filters are regular equipment. Flywheel, clutch, 30 kva. generator or marine gears may be attached to either end of the four cylinder engine so they may be installed in matched "right" and "left" units.

Those interested in further details on this addition to the Witte Diesel line are urged to write to the Witte Engine Works, 2447 Oakland Ave., Kansas City, Mo., or to the nearest Witte dealer.